



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:58 AM UTC

PDB ID : 8GF2 / pdb\_00008gf2  
Title : Crystal structure of SARS-CoV-2 receptor binding domain in complex with antibodies eCR3022.20 and CC12.3  
Authors : Yuan, M.; Zhu, X.; Wilson, I.A.  
Deposited on : 2023-03-07  
Resolution : 2.85 Å (reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

---

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

MolProbity : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

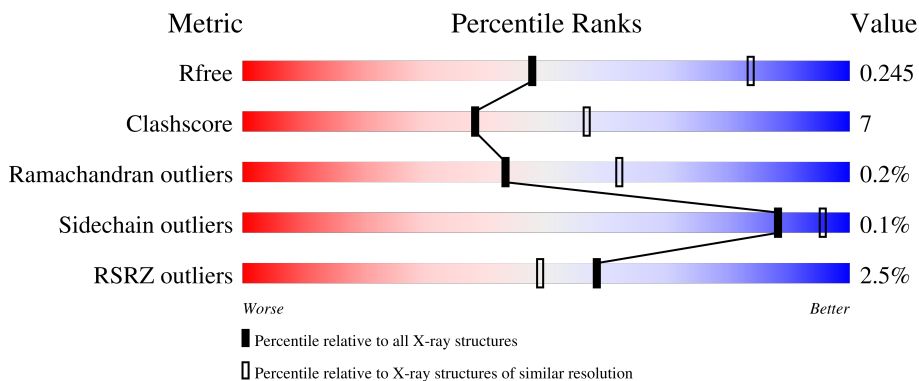
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.85 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))
$R_{free}$	180053	1407 (2.88-2.84)
Clashscore	190562	1446 (2.88-2.84)
Ramachandran outliers	187476	1406 (2.88-2.84)
Sidechain outliers	187428	1407 (2.88-2.84)
RSRZ outliers	180081	1408 (2.88-2.84)

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

Mol	Chain	Length	Quality of chain
1	A	231	 5% 68% 15% 17%
1	B	231	 3% 72% 11% 16%
2	C	220	 2% 77% 20% .
2	E	220	 3% 80% 20%
3	D	215	 5% 80% 18% .

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
3	F	215	 2% 86% 13%
4	H	222	 2% 84% 14%
4	X	222	 % 83% 15%
5	L	221	 87% 13%
5	Y	221	 84% 14%
6	G	2	 100%

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 16286 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 Spike protein S1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	192	1529	983	254	284	8	0	0	0
1	B	193	1537	987	256	286	8	0	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	542	SER	-	expression tag	UNP P0DTC2
A	543	GLY	-	expression tag	UNP P0DTC2
A	544	HIS	-	expression tag	UNP P0DTC2
A	545	HIS	-	expression tag	UNP P0DTC2
A	546	HIS	-	expression tag	UNP P0DTC2
A	547	HIS	-	expression tag	UNP P0DTC2
A	548	HIS	-	expression tag	UNP P0DTC2
A	549	HIS	-	expression tag	UNP P0DTC2
B	542	SER	-	expression tag	UNP P0DTC2
B	543	GLY	-	expression tag	UNP P0DTC2
B	544	HIS	-	expression tag	UNP P0DTC2
B	545	HIS	-	expression tag	UNP P0DTC2
B	546	HIS	-	expression tag	UNP P0DTC2
B	547	HIS	-	expression tag	UNP P0DTC2
B	548	HIS	-	expression tag	UNP P0DTC2
B	549	HIS	-	expression tag	UNP P0DTC2

- Molecule 2 is a protein called CC12.3 Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	213	1600	1016	264	314	6	0	0	0
2	E	220	1645	1040	272	326	7	0	0	0

- Molecule 3 is a protein called CC12.3 Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	D	211	Total	C	N	O	S	0	0	0
			1622	1014	277	327	4			
3	F	213	Total	C	N	O	S	0	0	0
			1635	1021	279	331	4			

- Molecule 4 is a protein called eCR3022.20 Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	H	218	Total	C	N	O	S	0	0	0
			1626	1036	265	317	8			
4	X	217	Total	C	N	O	S	0	0	0
			1623	1034	264	316	9			

- Molecule 5 is a protein called eCR3022.20 Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	L	221	Total	C	N	O	S	0	0	0
			1717	1080	283	349	5			
5	Y	220	Total	C	N	O	S	0	0	0
			1710	1077	282	346	5			

- Molecule 6 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
6	G	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).

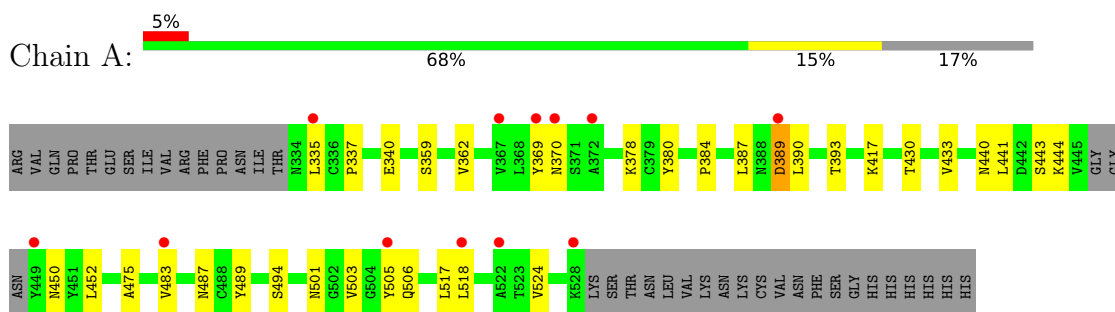


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
7	A	1	14	8	1	5	0	0

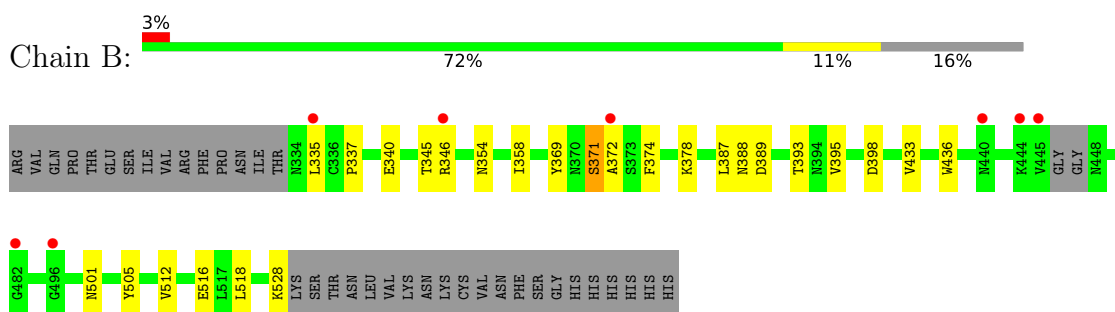
### 3 Residue-property plots [i](#)

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.

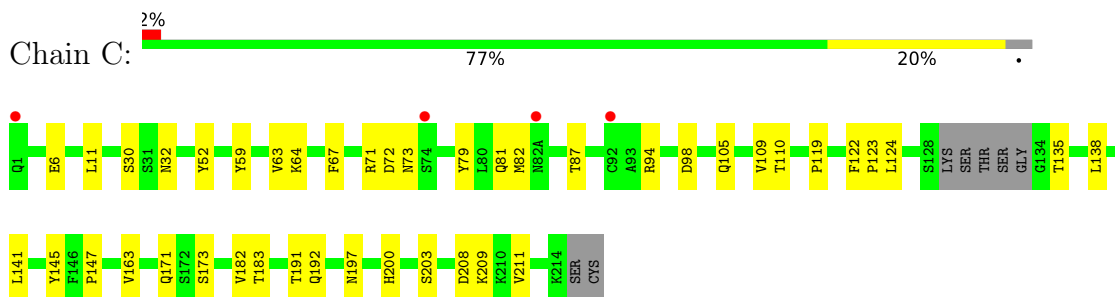
- Molecule 1: Spike protein S1



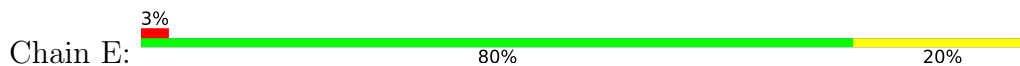
- Molecule 1: Spike protein S1



- Molecule 2: CC12.3 Fab heavy chain

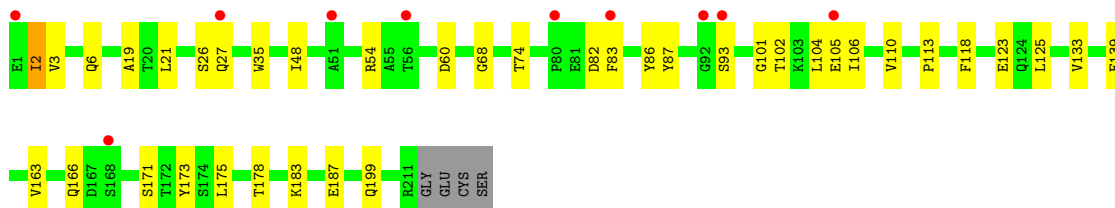
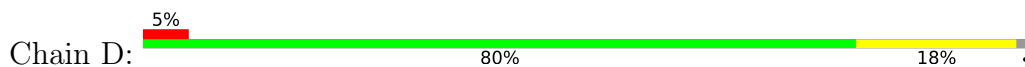


- Molecule 2: CC12.3 Fab heavy chain

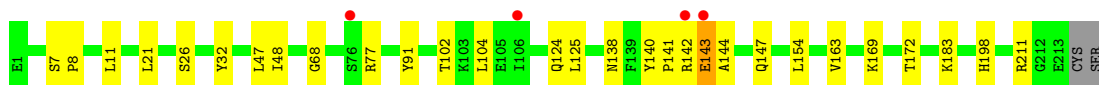
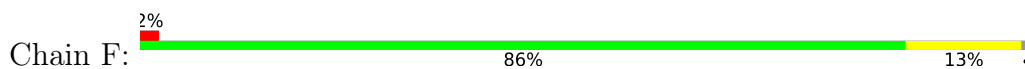




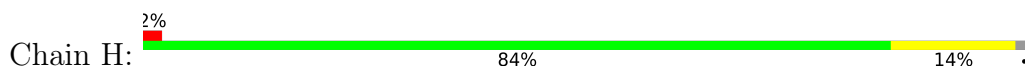
- Molecule 3: CC12.3 Fab light chain



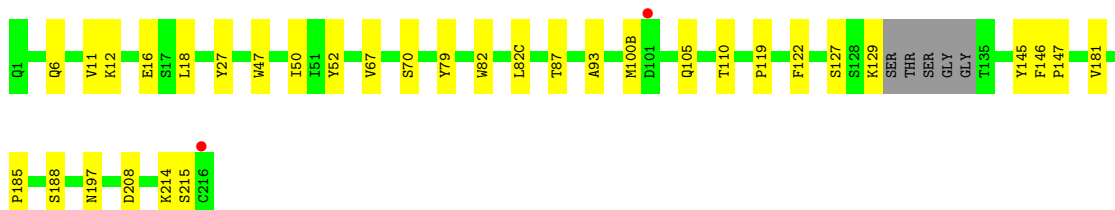
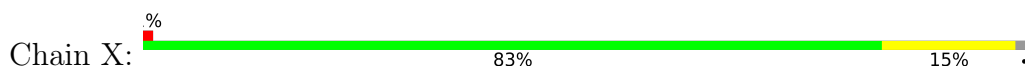
- Molecule 3: CC12.3 Fab light chain



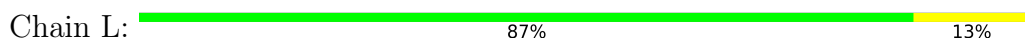
- Molecule 4: eCR3022.20 Fab heavy chain



- Molecule 4: eCR3022.20 Fab heavy chain

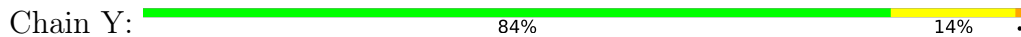


- Molecule 5: eCR3022.20 Fab light chain





- Molecule 5: eCR3022.20 Fab light chain



C214  
SER

- Molecule 6: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1  
MAG2

## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	157.57Å 161.22Å 230.12Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.83 – 2.85 46.83 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.1 (46.83-2.85) 99.1 (46.83-2.85)	Depositor EDS
$R_{merge}$	0.14	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.39 (at 2.86Å)	Xtrriage
Refinement program	PHENIX 1.16_3549	Depositor
R, $R_{free}$	0.209 , 0.252 0.210 , 0.245	Depositor DCC
$R_{free}$ test set	3441 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	60.6	Xtrriage
Anisotropy	0.262	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.29 , 26.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.022 for -k,-h,-l	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	16286	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.43% of the height of the origin peak. No significant pseudotranslation is detected.*

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

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section:  
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	0.23	0/1572	0.52	2/2138 (0.1%)
1	B	0.23	0/1580	0.56	3/2149 (0.1%)
2	C	0.17	0/1639	0.46	0/2231
2	E	0.16	0/1685	0.43	0/2292
3	D	0.22	0/1657	0.62	2/2249 (0.1%)
3	F	0.24	0/1670	0.62	4/2266 (0.2%)
4	H	0.19	0/1669	0.54	4/2272 (0.2%)
4	X	0.15	0/1666	0.41	0/2267
5	L	0.19	0/1757	0.45	1/2389 (0.0%)
5	Y	0.25	0/1750	0.53	5/2381 (0.2%)
All	All	0.20	0/16645	0.52	21/22634 (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
4	H	0	1

There are no bond length outliers.

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	105	GLU	CA-CB-CG	9.24	132.58	114.10
5	Y	188	LYS	CB-CG-CD	-7.79	93.38	111.30
4	H	66	GLN	CB-CG-CD	-7.75	99.42	112.60
5	L	187	GLU	CA-CB-CG	-7.32	99.46	114.10
1	B	345	THR	CA-C-N	6.85	133.83	122.73
1	B	345	THR	C-N-CA	6.85	133.83	122.73

*Continued on next page...*

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	143	GLU	CA-CB-CG	-6.45	101.20	114.10
3	F	26	SER	CA-C-N	6.45	132.93	122.81
3	F	26	SER	C-N-CA	6.45	132.93	122.81
5	Y	183	LYS	CB-CG-CD	-6.45	96.48	111.30
4	H	65	GLY	CA-C-N	-6.27	111.12	122.54
4	H	65	GLY	C-N-CA	-6.27	111.12	122.54
3	D	27	GLN	N-CA-CB	6.05	120.12	111.05
3	F	169	LYS	CD-CE-NZ	-6.00	92.70	111.90
5	Y	188	LYS	CA-CB-CG	5.91	125.91	114.10
1	B	346	ARG	CB-CG-CD	5.82	124.69	111.30
5	Y	183	LYS	CA-CB-CG	5.81	125.72	114.10
4	H	66	GLN	CA-CB-CG	5.56	125.21	114.10
1	A	483	VAL	CG1-CB-CG2	5.07	121.94	110.80
5	Y	188	LYS	CG-CD-CE	5.03	122.86	111.30
1	A	389	ASP	CB-CA-C	5.02	120.42	110.42

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
4	H	66	GLN	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	1529	0	1452	26	0
1	B	1537	0	1458	20	0
2	C	1600	0	1560	29	0
2	E	1645	0	1604	25	0
3	D	1622	0	1583	35	0
3	F	1635	0	1592	19	0
4	H	1626	0	1601	21	0
4	X	1623	0	1597	22	0
5	L	1717	0	1662	21	0
5	Y	1710	0	1656	22	0
6	G	28	0	25	0	0

Continued on next page...

*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	14	0	13	0	0
All	All	16286	0	15803	220	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 7.

All (220) 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)
3:F:141:PRO:HB2	3:F:143:GLU:OE1	1.43	1.16
3:D:106:ILE:HD11	3:D:171:SER:HB3	1.33	1.11
3:D:83:PHE:CD1	3:D:106:ILE:HG22	1.99	0.96
3:D:83:PHE:CG	3:D:106:ILE:HG22	2.02	0.95
2:E:121:VAL:HG21	2:E:198:VAL:HG11	1.51	0.91
3:F:147:GLN:HG2	3:F:154:LEU:HD11	1.56	0.88
5:L:189:HIS:O	5:L:211:ARG:NH2	2.19	0.76
3:D:106:ILE:HD11	3:D:171:SER:CB	2.14	0.75
3:D:125:LEU:O	3:D:183:LYS:CE	2.35	0.75
3:D:83:PHE:CG	3:D:106:ILE:CG2	2.70	0.74
4:X:185:PRO:O	4:X:188:SER:OG	2.07	0.72
1:A:489:TYR:OH	2:C:94:ARG:NH2	2.26	0.68
3:D:83:PHE:CE1	3:D:106:ILE:HG22	2.28	0.68
1:B:369:TYR:HB3	4:X:27:TYR:HE1	1.60	0.67
2:E:119:PRO:HB3	2:E:145:TYR:HB3	1.76	0.67
5:Y:128:GLY:HA2	5:Y:183:LYS:HD2	1.75	0.66
5:Y:80:ALA:HA	5:Y:106:ILE:HD11	1.78	0.66
2:E:199:ASN:HD21	2:E:201:LYS:HG3	1.62	0.64
4:H:32:TYR:OH	4:H:101:ASP:OD2	2.07	0.64
5:L:6:GLN:O	5:L:100:GLN:NE2	2.31	0.64
1:A:378:LYS:NZ	4:H:56:GLU:OE1	2.31	0.63
3:D:83:PHE:CD2	3:D:106:ILE:CG2	2.82	0.63
1:A:337:PRO:HB2	1:A:340:GLU:HG3	1.79	0.63
3:D:83:PHE:CD2	3:D:106:ILE:HG22	2.33	0.62
1:B:393:THR:HG21	1:B:518:LEU:H	1.63	0.62
3:D:125:LEU:O	3:D:183:LYS:HE3	1.99	0.62
2:C:163:VAL:HG22	2:C:182:VAL:HG12	1.81	0.62
3:D:106:ILE:CD1	3:D:171:SER:HB3	2.20	0.62
2:E:66:ARG:NH2	2:E:86:ASP:OD2	2.32	0.62
2:C:59:TYR:HB2	2:C:64:LYS:HG3	1.80	0.62
4:H:27:TYR:HE2	4:H:31:TRP:CZ2	2.19	0.61
2:E:11:LEU:HB2	2:E:147:PRO:HG3	1.82	0.60

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:125:LEU:O	3:D:183:LYS:HE2	2.01	0.60
1:B:369:TYR:HB3	4:X:27:TYR:CE1	2.37	0.59
2:C:52:TYR:O	2:C:71:ARG:NH2	2.36	0.59
5:L:21:ILE:HG12	5:L:102:THR:HG21	1.85	0.59
1:A:390:LEU:HD21	5:L:50:TRP:HZ3	1.68	0.59
1:B:358:ILE:HB	1:B:395:VAL:HB	1.84	0.59
2:C:119:PRO:HB3	2:C:145:TYR:HB3	1.83	0.59
1:A:501:ASN:HB3	1:A:505:TYR:HB2	1.86	0.58
4:H:127:SER:OG	4:H:129:LYS:HG3	2.03	0.58
4:X:181:VAL:HG11	5:Y:135:LEU:HD13	1.86	0.58
1:A:440:ASN:HB2	1:A:441:LEU:HD12	1.86	0.58
4:H:87:THR:HG23	4:H:110:THR:HA	1.86	0.58
1:B:501:ASN:HB3	1:B:505:TYR:HB2	1.86	0.57
3:F:47:LEU:HB3	3:F:48:ILE:HD12	1.85	0.57
2:E:30:SER:OG	2:E:73:ASN:ND2	2.32	0.57
4:X:214:LYS:HE2	5:Y:122:ASP:OD2	2.03	0.56
2:C:191:THR:OG1	2:C:192:GLN:N	2.38	0.56
5:Y:85:VAL:HG22	5:Y:103:LYS:HG2	1.87	0.56
5:Y:20:THR:HG22	5:Y:74:THR:HG23	1.86	0.56
5:Y:25:SER:OG	5:Y:27:GLN:O	2.24	0.55
3:D:2:ILE:HG13	3:D:26:SER:HB3	1.88	0.55
4:H:134:GLY:N	4:H:186:SER:HG	2.03	0.55
2:C:123:PRO:HB3	2:C:211:VAL:HG12	1.88	0.55
1:B:337:PRO:HB2	1:B:340:GLU:HG3	1.88	0.55
5:Y:90:GLN:OE1	5:Y:92:TYR:HB3	2.06	0.54
1:A:503:VAL:HA	1:A:506:GLN:HG3	1.89	0.54
2:E:138:LEU:HD13	2:E:211:VAL:HG21	1.88	0.53
1:B:369:TYR:OH	1:B:388:ASN:OD1	2.17	0.53
2:E:82:MET:HE1	2:E:109:VAL:HG21	1.90	0.53
4:X:197:ASN:ND2	4:X:208:ASP:OD2	2.29	0.53
1:B:389:ASP:CB	1:B:528:LYS:HD2	2.38	0.53
1:B:389:ASP:HB3	1:B:528:LYS:HD2	1.91	0.52
4:X:12:LYS:HD3	4:X:16:GLU:OE2	2.09	0.52
2:C:11:LEU:HB2	2:C:147:PRO:HG3	1.92	0.52
3:D:54:ARG:NH1	3:D:60:ASP:HA	2.24	0.52
4:X:87:THR:HG23	4:X:110:THR:HA	1.92	0.52
1:A:387:LEU:C	1:A:389:ASP:H	2.17	0.52
4:H:2:MET:HG2	4:H:25:SER:O	2.10	0.51
5:L:163:VAL:HG22	5:L:175:LEU:HD12	1.92	0.51
3:D:83:PHE:HD1	3:D:104:LEU:HG	1.74	0.51
5:L:187:GLU:HG2	5:L:211:ARG:NE	2.26	0.51

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:L:140:TYR:CD1	5:L:141:PRO:HA	2.46	0.51
3:D:163:VAL:HG22	3:D:175:LEU:HD12	1.92	0.51
3:F:47:LEU:C	3:F:48:ILE:HD12	2.36	0.51
1:A:487:ASN:OD1	2:C:94:ARG:NH2	2.43	0.51
2:C:209:LYS:NZ	3:D:123:GLU:OE2	2.31	0.51
5:Y:27(B):VAL:HG11	5:Y:90:GLN:HG3	1.93	0.51
5:L:6:GLN:HE22	5:L:88:CYS:H	1.57	0.50
2:E:30:SER:CB	2:E:73:ASN:HD22	2.23	0.50
3:D:3:VAL:HG12	3:D:26:SER:HB2	1.93	0.50
5:Y:13:VAL:HG21	5:Y:19:ALA:HB2	1.93	0.50
2:E:186:SER:HA	2:E:189:LEU:CD2	2.41	0.50
2:C:135:THR:CG2	2:C:183:THR:HG23	2.41	0.50
2:E:87:THR:HG23	2:E:110:THR:HA	1.94	0.50
2:C:138:LEU:HD13	2:C:211:VAL:HG21	1.93	0.50
2:C:30:SER:HB2	2:C:73:ASN:ND2	2.27	0.50
3:D:83:PHE:CD2	3:D:106:ILE:HG21	2.46	0.50
2:E:84:VAL:HA	2:E:111:VAL:HB	1.93	0.50
1:B:374:PHE:HA	1:B:436:TRP:HB3	1.92	0.50
1:B:335:LEU:HD23	1:B:335:LEU:H	1.76	0.49
2:E:191:THR:OG1	2:E:192:GLN:N	2.46	0.49
1:B:393:THR:OG1	1:B:516:GLU:O	2.21	0.49
2:E:72:ASP:HB2	2:E:79:TYR:HE2	1.78	0.49
3:D:6:GLN:HE22	3:D:87:TYR:HA	1.77	0.49
4:H:200:HIS:CD2	4:H:202:PRO:HD2	2.46	0.49
5:Y:18:ARG:HA	5:Y:75:ILE:O	2.12	0.49
4:H:4:LEU:HD22	4:H:22:CYS:SG	2.53	0.49
2:C:138:LEU:HD13	2:C:211:VAL:CG2	2.43	0.49
4:X:127:SER:OG	4:X:129:LYS:HD2	2.12	0.49
1:B:389:ASP:HB2	1:B:528:LYS:CD	2.41	0.49
4:H:47:TRP:HZ2	4:H:50:ILE:HB	1.77	0.48
1:A:380:TYR:HA	4:H:98:ILE:HG22	1.95	0.48
5:L:6:GLN:NE2	5:L:88:CYS:SG	2.86	0.48
3:F:140:TYR:CG	3:F:141:PRO:HA	2.47	0.48
1:A:380:TYR:O	1:A:430:THR:HA	2.12	0.48
4:H:27:TYR:CD2	4:H:28:GLY:N	2.82	0.48
5:L:152:ASN:O	5:L:152:ASN:ND2	2.46	0.48
3:F:142:ARG:NH1	3:F:163:VAL:HG11	2.28	0.48
5:L:140:TYR:CG	5:L:141:PRO:HA	2.48	0.47
5:L:187:GLU:HG2	5:L:211:ARG:CD	2.44	0.47
3:D:82:ASP:O	3:D:86:TYR:OH	2.29	0.47
3:D:183:LYS:O	3:D:187:GLU:HG3	2.14	0.47

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:135:THR:HG23	2:C:183:THR:HG23	1.95	0.47
1:A:369:TYR:O	4:H:31:TRP:HZ3	1.97	0.47
3:F:21:LEU:HD23	3:F:102:THR:HB	1.97	0.47
1:A:335:LEU:HD23	1:A:335:LEU:H	1.80	0.47
1:B:378:LYS:HD3	4:X:52:TYR:CD2	2.50	0.47
3:F:32:TYR:HB3	3:F:91:TYR:CE2	2.50	0.47
4:X:119:PRO:HB3	4:X:145:TYR:HB3	1.97	0.47
4:H:119:PRO:HB3	4:H:145:TYR:HB3	1.97	0.46
5:Y:167:ASP:OD2	5:Y:168:SER:N	2.48	0.46
1:A:393:THR:HG21	1:A:518:LEU:H	1.80	0.46
5:L:187:GLU:HG2	5:L:211:ARG:HD2	1.97	0.46
1:A:384:PRO:HA	1:A:387:LEU:HD22	1.96	0.46
5:Y:184:ALA:O	5:Y:188:LYS:HB2	2.16	0.46
2:C:87:THR:HG23	2:C:110:THR:HA	1.98	0.46
1:B:354:ASN:O	1:B:398:ASP:HA	2.15	0.46
3:D:21:LEU:HD23	3:D:102:THR:HB	1.98	0.46
1:A:335:LEU:HA	1:A:362:VAL:O	2.16	0.46
2:C:6:GLU:H	2:C:105:GLN:HE22	1.64	0.46
1:A:393:THR:HG23	1:A:517:LEU:HA	1.98	0.45
3:F:138:ASN:HA	3:F:172:THR:HB	1.98	0.45
4:X:67:VAL:HG12	4:X:82:TRP:NE1	2.31	0.45
5:L:13:VAL:HB	5:L:78:LEU:HD22	1.99	0.45
5:L:89:GLN:HE21	5:L:96:TYR:HB3	1.80	0.45
4:X:181:VAL:HG21	5:Y:135:LEU:HD11	1.97	0.45
4:H:27:TYR:CE2	4:H:31:TRP:CZ2	3.02	0.45
2:E:210:LYS:HB3	2:E:210:LYS:HE3	1.47	0.45
4:H:1:GLN:HA	4:H:27:TYR:HE1	1.81	0.45
2:C:200:HIS:ND1	2:C:203:SER:HB3	2.31	0.45
3:D:6:GLN:OE1	3:D:101:GLY:N	2.44	0.45
3:D:133:VAL:HG22	3:D:178:THR:HG22	1.99	0.45
4:X:93:ALA:HB3	4:X:100(B):MET:HE2	1.99	0.45
2:E:12:ILE:HG21	2:E:82(C):LEU:HD13	1.98	0.45
2:C:72:ASP:HB2	2:C:79:TYR:HE1	1.82	0.45
1:B:387:LEU:C	1:B:389:ASP:H	2.24	0.45
1:B:389:ASP:CB	1:B:528:LYS:CD	2.95	0.45
2:E:33:TYR:CE1	2:E:97:GLY:HA2	2.52	0.44
3:F:125:LEU:HD22	3:F:183:LYS:HG3	2.00	0.44
2:C:124:LEU:HB3	3:D:118:PHE:CD2	2.53	0.44
4:X:18:LEU:HB2	4:X:82(C):LEU:HD11	1.98	0.44
4:H:101:ASP:OD2	4:H:102:VAL:HG23	2.17	0.44
5:L:38:GLN:O	5:L:84:ALA:HB1	2.18	0.44

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:L:184:ALA:O	5:L:188:LYS:HG3	2.18	0.44
2:E:34:MET:HE2	2:E:78:LEU:HD22	1.99	0.44
3:D:35:TRP:HB2	3:D:48:ILE:HB	2.00	0.43
3:F:211:ARG:HE	3:F:211:ARG:HB3	1.62	0.43
5:Y:125:LEU:HD23	5:Y:125:LEU:HA	1.73	0.43
5:Y:140:TYR:CG	5:Y:141:PRO:HA	2.53	0.43
3:F:144:ALA:HB2	3:F:198:HIS:HD2	1.83	0.43
5:L:61:ARG:HB2	5:L:76:SER:O	2.18	0.43
2:E:39:GLN:HB2	2:E:45:LEU:HD23	2.00	0.43
1:A:378:LYS:HB2	1:A:433:VAL:HG22	1.99	0.43
5:L:67:SER:OG	5:L:68:GLY:N	2.51	0.43
5:Y:123:GLU:O	5:Y:126:LYS:HB3	2.19	0.43
3:F:32:TYR:HB3	3:F:91:TYR:CD2	2.53	0.43
4:H:143:LYS:HG2	4:H:144:ASP:CG	2.44	0.43
2:C:67:PHE:HA	2:C:81:GLN:O	2.19	0.43
3:D:166:GLN:HG2	3:D:173:TYR:CZ	2.54	0.43
4:H:1:GLN:CA	4:H:27:TYR:HE1	2.31	0.43
5:Y:119:PRO:HB3	5:Y:209:PHE:CZ	2.53	0.43
2:E:17:SER:HA	2:E:82:MET:O	2.20	0.42
5:L:13:VAL:HG12	5:L:17:GLU:HB2	1.99	0.42
2:C:197:ASN:HD22	2:C:208:ASP:CG	2.26	0.42
2:E:150:VAL:CG1	2:E:178:LEU:HD13	2.50	0.42
2:E:199:ASN:ND2	2:E:201:LYS:HG3	2.32	0.42
4:X:11:VAL:HG11	4:X:147:PRO:HG3	2.00	0.42
4:X:6:GLN:H	4:X:105:GLN:NE2	2.17	0.42
5:Y:13:VAL:HB	5:Y:78:LEU:HD22	2.01	0.42
1:A:337:PRO:HB2	1:A:340:GLU:CG	2.49	0.42
3:F:11:LEU:HB3	3:F:104:LEU:HD13	2.01	0.42
4:X:70:SER:OG	4:X:79:TYR:HB2	2.19	0.42
4:X:214:LYS:HG2	4:X:215:SER:H	1.84	0.42
1:B:393:THR:CG2	1:B:518:LEU:H	2.29	0.42
1:A:452:LEU:HD23	1:A:494:SER:HA	2.02	0.42
2:C:73:ASN:OD1	2:C:73:ASN:N	2.52	0.42
2:C:171:GLN:HB2	2:C:173:SER:OG	2.20	0.41
3:F:140:TYR:CD2	3:F:141:PRO:HA	2.55	0.41
3:F:142:ARG:HH11	3:F:163:VAL:HG11	1.84	0.41
4:X:47:TRP:HZ2	4:X:50:ILE:HB	1.84	0.41
1:A:505:TYR:OH	3:D:93:SER:HB3	2.19	0.41
5:Y:119:PRO:HB3	5:Y:209:PHE:CE2	2.55	0.41
1:A:475:ALA:HB1	2:C:32:ASN:HD21	1.85	0.41
2:C:122:PHE:HD1	2:C:141:LEU:HD23	1.84	0.41

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:83:PHE:CD1	3:D:104:LEU:HG	2.53	0.41
4:H:18:LEU:HB2	4:H:82(C):LEU:HD11	2.03	0.41
3:F:7:SER:HA	3:F:8:PRO:HA	1.79	0.41
1:B:371:SER:HB2	1:B:372:ALA:H	1.68	0.41
4:X:122:PHE:CE1	5:Y:124:GLN:HG3	2.55	0.41
4:X:146:PHE:HA	4:X:147:PRO:HA	1.87	0.41
2:C:63:VAL:HB	2:C:67:PHE:CG	2.56	0.41
1:B:433:VAL:HG22	1:B:512:VAL:HG22	2.02	0.41
2:E:36:TRP:NE1	2:E:80:LEU:HB2	2.35	0.41
1:A:370:ASN:ND2	4:H:27:TYR:HB2	2.36	0.41
1:A:443:SER:C	1:A:444:LYS:HD3	2.46	0.41
3:D:83:PHE:CE2	3:D:106:ILE:HG22	2.56	0.41
3:D:110:VAL:HG21	3:D:199:GLN:OE1	2.20	0.41
1:A:359:SER:HA	1:A:524:VAL:HG22	2.01	0.41
3:D:19:ALA:O	3:D:74:THR:HA	2.21	0.41
5:Y:6:GLN:O	5:Y:100:GLN:NE2	2.50	0.41
3:D:83:PHE:CZ	3:D:106:ILE:HG22	2.56	0.40
1:A:417:LYS:NZ	2:C:98:ASP:HB3	2.37	0.40
2:C:82:MET:HE1	2:C:109:VAL:HG21	2.04	0.40
3:D:113:PRO:HB3	3:D:139:PHE:HB3	2.03	0.40
2:E:122:PHE:CE2	3:F:124:GLN:HG3	2.56	0.40
3:F:77:ARG:HH11	3:F:77:ARG:HG3	1.86	0.40
5:L:37:GLN:HB2	5:L:86:TYR:CE2	2.57	0.40
2:E:206:LYS:HB3	2:E:206:LYS:HE3	1.80	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	188/231 (81%)	174 (93%)	13 (7%)	1 (0%)	24 42

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	189/231 (82%)	172 (91%)	16 (8%)	1 (0%)	24	42
2	C	209/220 (95%)	202 (97%)	7 (3%)	0	100	100
2	E	218/220 (99%)	209 (96%)	8 (4%)	1 (0%)	24	42
3	D	209/215 (97%)	198 (95%)	10 (5%)	1 (0%)	24	42
3	F	211/215 (98%)	205 (97%)	5 (2%)	1 (0%)	24	42
4	H	214/222 (96%)	206 (96%)	8 (4%)	0	100	100
4	X	213/222 (96%)	208 (98%)	5 (2%)	0	100	100
5	L	219/221 (99%)	211 (96%)	8 (4%)	0	100	100
5	Y	218/221 (99%)	212 (97%)	6 (3%)	0	100	100
All	All	2088/2218 (94%)	1997 (96%)	86 (4%)	5 (0%)	43	62

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	371	SER
1	A	450	ASN
2	E	132	SER
3	F	68	GLY
3	D	68	GLY

### 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	167/203 (82%)	167 (100%)	0	100	100
1	B	168/203 (83%)	168 (100%)	0	100	100
2	C	180/186 (97%)	180 (100%)	0	100	100
2	E	186/186 (100%)	186 (100%)	0	100	100
3	D	183/186 (98%)	182 (100%)	1 (0%)	81	90
3	F	184/186 (99%)	184 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	H	182/185 (98%)	182 (100%)	0	100	100
4	X	182/185 (98%)	182 (100%)	0	100	100
5	L	196/196 (100%)	196 (100%)	0	100	100
5	Y	195/196 (100%)	195 (100%)	0	100	100
All	All	1823/1912 (95%)	1822 (100%)	1 (0%)	88	95

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	D	2	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	440	ASN
2	C	32	ASN
2	C	155	ASN
2	C	164	HIS
3	D	137	ASN
4	H	81	GLN
4	H	192	GLN
5	L	37	GLN
1	B	334	ASN
1	B	360	ASN
3	F	37	GLN
3	F	147	GLN
3	F	189	HIS
4	X	192	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

## 5.5 Carbohydrates

2 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	NAG	G	1	6,1	14,14,15	0.29	0	17,19,21	0.46	0
6	NAG	G	2	6	14,14,15	0.21	0	17,19,21	0.47	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	NAG	G	1	6,1	-	0/6/23/26	0/1/1/1
6	NAG	G	2	6	-	1/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

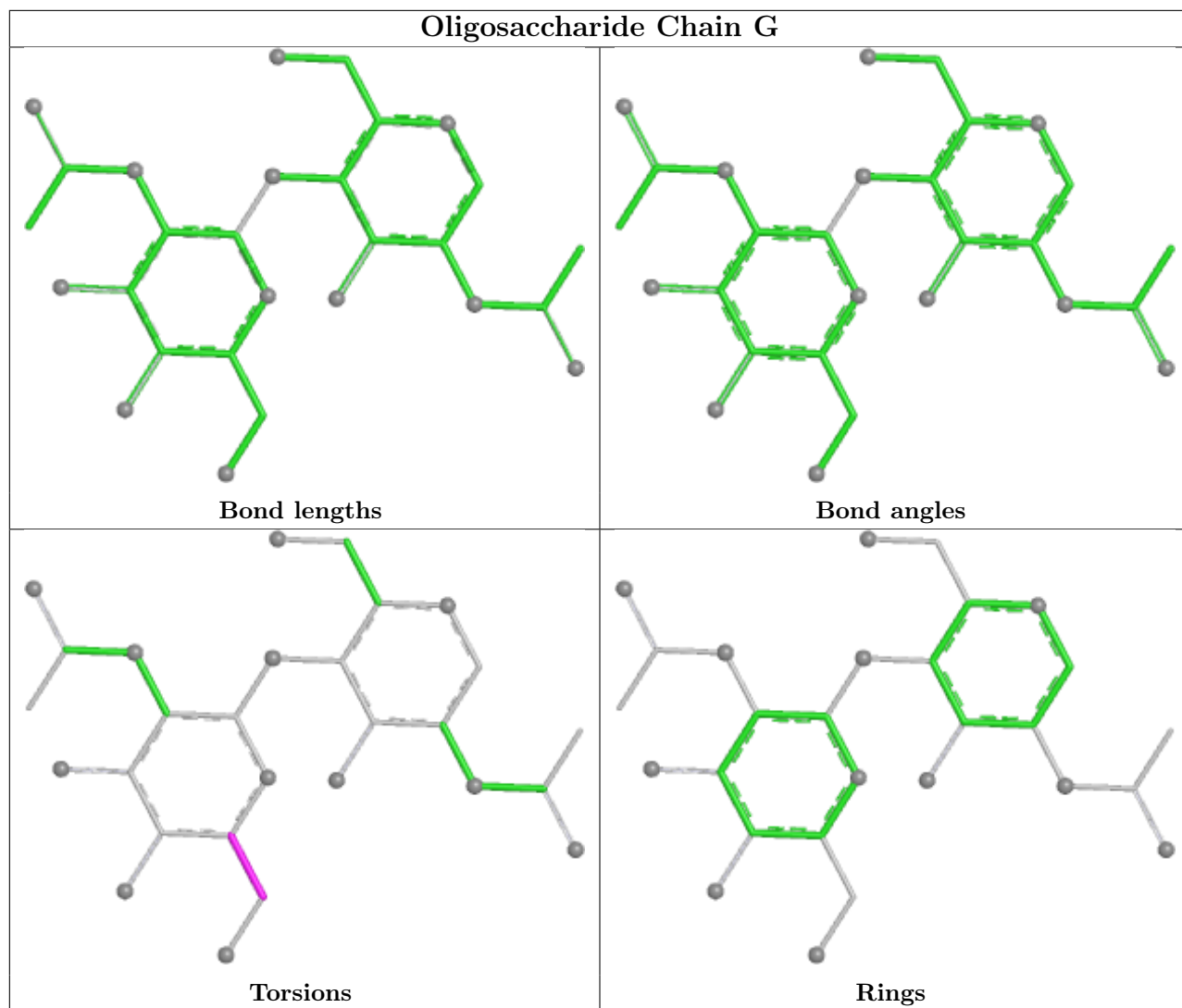
All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	G	2	NAG	C4-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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



## 5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
7	NAG	A	601	1	14,14,15	0.35	0	17,19,21	0.46	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
7	NAG	A	601	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 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, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	192/231 (83%)	0.40	12 (6%) 26 19	39, 62, 109, 133	0
1	B	193/231 (83%)	0.13	8 (4%) 41 32	32, 52, 98, 127	0
2	C	213/220 (96%)	0.12	4 (1%) 66 59	37, 57, 95, 108	0
2	E	220/220 (100%)	0.18	7 (3%) 50 41	32, 56, 106, 167	0
3	D	211/215 (98%)	0.29	10 (4%) 36 28	38, 60, 89, 112	0
3	F	213/215 (99%)	0.21	4 (1%) 66 59	38, 61, 85, 130	0
4	H	218/222 (98%)	0.08	4 (1%) 67 61	38, 54, 91, 141	0
4	X	217/222 (97%)	0.11	2 (0%) 81 76	32, 56, 96, 145	0
5	L	221/221 (100%)	-0.06	1 (0%) 87 85	37, 52, 78, 156	0
5	Y	220/221 (99%)	-0.07	1 (0%) 87 85	34, 54, 82, 147	0
All	All	2118/2218 (95%)	0.14	53 (2%) 58 49	32, 56, 96, 167	0

All (53) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	445	VAL	4.9
1	A	449	TYR	4.7
3	F	76	SER	4.5
1	A	505	TYR	4.2
1	B	372	ALA	4.1
3	D	105	GLU	4.1
4	H	130	SER	4.0
3	D	27	GLN	3.8
2	E	130	SER	3.7
4	H	129	LYS	3.3
5	L	1	ASP	3.2
1	A	528	LYS	3.2
2	E	131	THR	3.2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
4	H	27	TYR	3.1
1	B	346	ARG	3.1
1	A	369	TYR	3.0
4	X	101	ASP	3.0
1	B	335	LEU	2.9
2	C	92	CYS	2.8
2	C	74	SER	2.8
3	D	83	PHE	2.7
4	H	215	SER	2.6
2	E	1	GLN	2.6
1	B	444	LYS	2.5
3	D	168	SER	2.5
3	F	106	ILE	2.5
1	A	389	ASP	2.5
1	A	335	LEU	2.5
3	D	80	PRO	2.4
2	E	215	SER	2.4
3	D	56	THR	2.4
1	B	440	ASN	2.4
5	Y	1	ASP	2.4
3	F	143	GLU	2.4
2	E	193	THR	2.4
1	A	518	LEU	2.4
1	B	482	GLY	2.3
3	D	51	ALA	2.3
4	X	216	CYS	2.2
1	A	367	VAL	2.2
1	A	483	VAL	2.2
2	E	187	SER	2.2
1	A	372	ALA	2.2
1	A	370	ASN	2.2
3	D	1	GLU	2.1
2	C	82(A)	ASN	2.1
2	E	73	ASN	2.1
3	F	142	ARG	2.1
1	B	496	GLY	2.1
3	D	93	SER	2.0
2	C	1	GLN	2.0
3	D	92	GLY	2.0
1	A	522	ALA	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

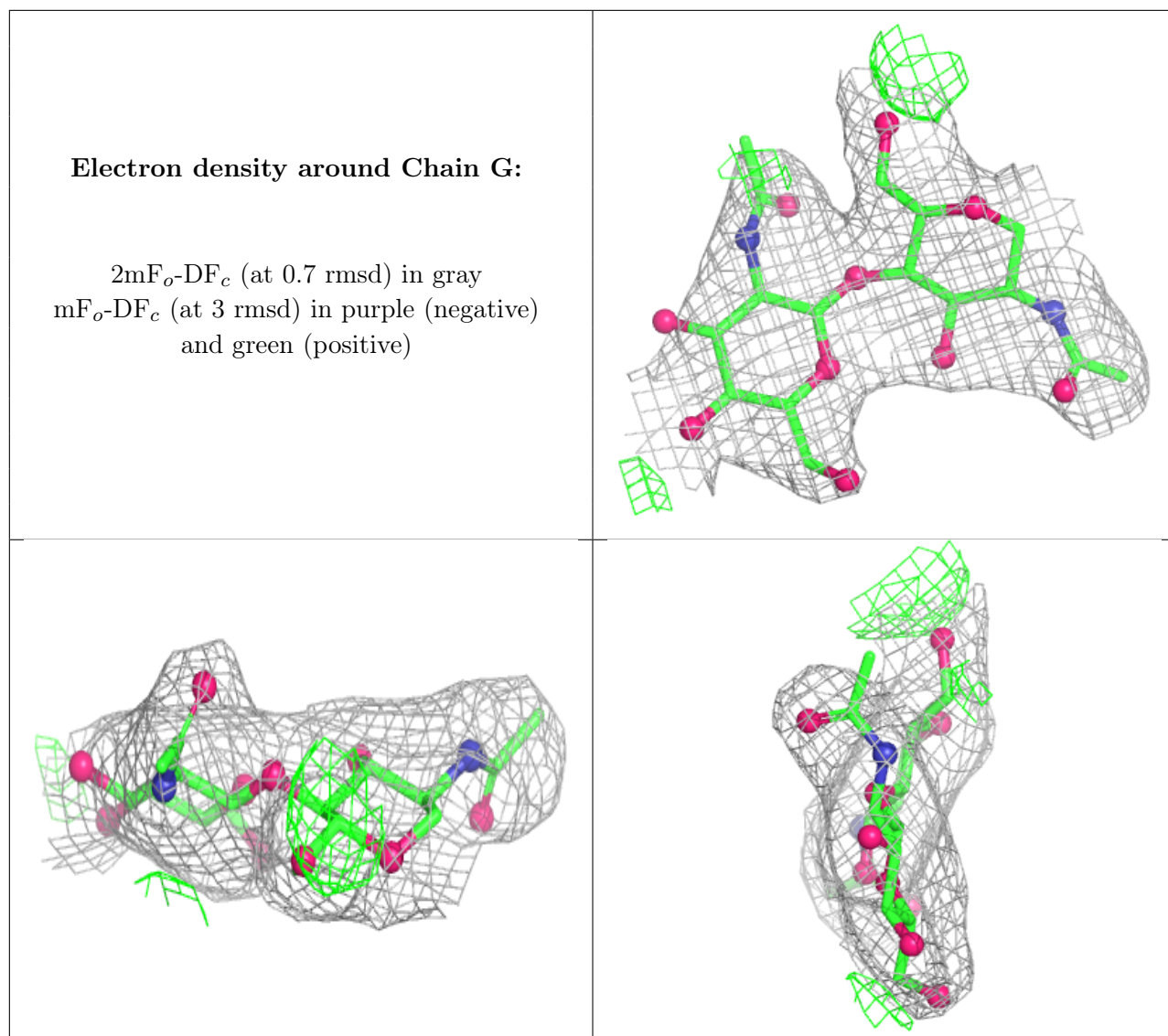
There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	NAG	G	1	14/15	-	-	47,58,67,74	0
6	NAG	G	2	14/15	-	-	58,74,88,93	0

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



## 6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
7	NAG	A	601	14/15	0.64	0.19	113,118,122,122	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.