



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 15, 2024 – 02:13 pm GMT

PDB ID : 6HV7
Title : Yeast 20S proteasome with human beta2i (1-53) in complex with 7
Authors : Huber, E.M.; Groll, M.
Deposited on : 2018-10-10
Resolution : 3.40 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The 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 : 4.02b-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

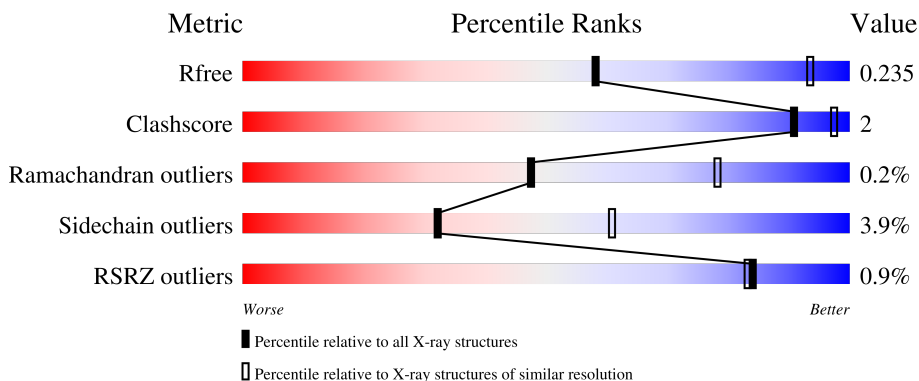
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.40 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	1026 (3.48-3.32)
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)
RSRZ outliers	127900	2173 (3.50-3.30)

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 $\leq 5\%$. 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	250	97%
1	O	250	2% 97%
2	B	258	% 87% 7% 5%
2	P	258	2% 89% 5% 5%
3	C	254	% 87% 7% 6%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	Q	254	3% 87% 7% 6%
4	D	260	85% 5% 10%
4	R	260	% 83% 7% 10%
5	E	234	% 91% 8%
5	S	234	% 93% 6%
6	F	288	80% 16%
6	T	288	% 80% 16%
7	G	252	90% 6%
7	U	252	% 90% 6%
8	H	226	2% 91% 8%
8	V	226	% 91% 7%
9	I	205	95% 5%
9	W	205	94% 5%
10	J	198	% 92% 6%
10	X	198	% 92% 6%
11	K	212	84% 13%
11	Y	212	84% 14%
12	L	222	89% 10%
12	Z	222	89% 10%
13	M	246	91% 5%
13	a	246	91% 5%
14	N	196	95% 10%
14	b	196	% 98%

2 Entry composition

There are 17 unique types of molecules in this entry. The entry contains 49506 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 Proteasome subunit alpha type-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	250	Total 1915	C 1219	N 315	O 377	S 4	0	0	0
1	O	250	Total 1915	C 1219	N 315	O 377	S 4	0	0	0

- Molecule 2 is a protein called Proteasome subunit alpha type-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	244	Total 1904	C 1201	N 321	O 379	S 3	0	0	0
2	P	244	Total 1904	C 1201	N 321	O 379	S 3	0	0	0

- Molecule 3 is a protein called Proteasome subunit alpha type-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	240	Total 1881	C 1176	N 329	O 372	S 4	0	0	0
3	Q	240	Total 1881	C 1176	N 329	O 372	S 4	0	0	0

- Molecule 4 is a protein called Proteasome subunit alpha type-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	D	235	Total 1813	C 1136	N 304	O 366	S 7	0	0	0
4	R	235	Total 1813	C 1136	N 304	O 366	S 7	0	0	0

- Molecule 5 is a protein called Proteasome subunit alpha type-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	E	231	Total 1773	C 1114	N 307	O 348	S 4	0	0	0
5	S	231	Total 1773	C 1114	N 307	O 348	S 4	0	0	0

- Molecule 6 is a protein called Probable proteasome subunit alpha type-7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
6	F	243	Total 1892	C 1203	N 329	O 356	S 4	0	0	0
6	T	243	Total 1892	C 1203	N 329	O 356	S 4	0	0	0

- Molecule 7 is a protein called Proteasome subunit alpha type-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
7	G	241	Total 1907	C 1214	N 320	O 365	S 8	0	0	0
7	U	241	Total 1907	C 1214	N 320	O 365	S 8	0	0	0

- Molecule 8 is a protein called Proteasome subunit beta type-10, Proteasome subunit beta type-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
8	H	226	Total 1716	C 1081	N 291	O 336	S 8	0	0	0
8	V	223	Total 1688	C 1066	N 287	O 327	S 8	0	0	0

- Molecule 9 is a protein called Proteasome subunit beta type-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
9	I	204	Total 1581	C 1010	N 258	O 305	S 8	0	0	0
9	W	204	Total 1581	C 1010	N 258	O 305	S 8	0	0	0

- Molecule 10 is a protein called Proteasome subunit beta type-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
10	J	195	Total 1561	C 992	N 264	O 299	S 6	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	X	195	Total	C	N	O	S	0	0	0
			1561	992	264	299	6			

- Molecule 11 is a protein called Proteasome subunit beta type-5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
11	K	212	Total	C	N	O	S	0	0	0
			1644	1045	280	312	7			
11	Y	212	Total	C	N	O	S	0	0	0
			1644	1045	280	312	7			

- Molecule 12 is a protein called Proteasome subunit beta type-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	222	Total	C	N	O	S	0	0	0
			1757	1115	303	335	4			
12	Z	222	Total	C	N	O	S	0	0	0
			1757	1115	303	335	4			

- Molecule 13 is a protein called Proteasome subunit beta type-7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
13	M	233	Total	C	N	O	S	0	0	0
			1824	1154	312	351	7			
13	a	233	Total	C	N	O	S	0	0	0
			1824	1154	312	351	7			

- Molecule 14 is a protein called Proteasome subunit beta type-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
14	N	196	Total	C	N	O	S	0	0	0
			1512	955	250	300	7			
14	b	196	Total	C	N	O	S	0	0	0
			1512	955	250	300	7			

- Molecule 15 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
15	G	1	Total	Mg	0	0
			1	1		
15	I	1	Total	Mg	0	0
			1	1		

Continued on next page...

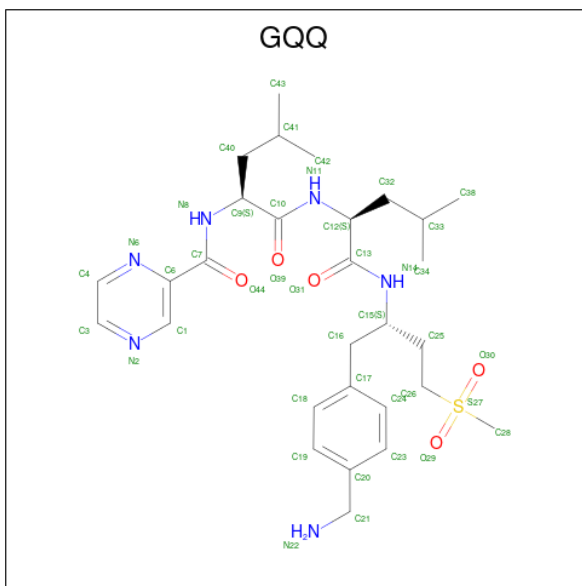
Continued from previous page...

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
15	K	1	Total Mg 1 1	0	0
15	N	1	Total Mg 1 1	0	0
15	V	1	Total Mg 1 1	0	0
15	W	1	Total Mg 1 1	0	0
15	Y	1	Total Mg 1 1	0	0
15	Z	1	Total Mg 1 1	0	0

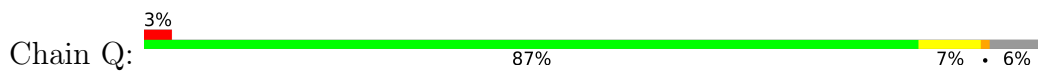
- Molecule 16 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
16	G	1	Total Cl 1 1	0	0
16	U	1	Total Cl 1 1	0	0

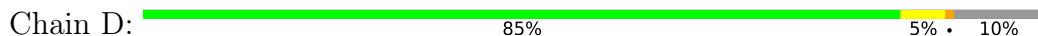
- Molecule 17 is {N}-[(2 {S})-1-[[[(2 {S})-1-[[[(2 {S})-1-[4-(aminomethyl)phenyl]-4-methylsulfonyl-butan-2-yl]amino]-4-methyl-1-oxidanylidene-pentan-2-yl]amino]-4-methyl-1-oxidanylidene-pentan-2-yl]pyrazine-2-carboxamide (three-letter code: GQQ) (formula: C₂₉H₄₄N₆O₅S).



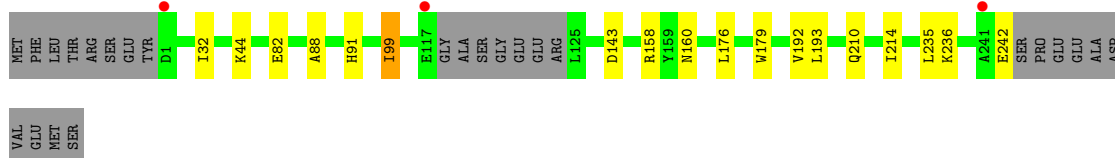
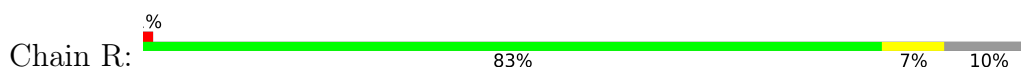
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
17	H	1	Total 41	C 29	N 6	O 5	S 1	0	0
17	K	1	Total 41	C 29	N 6	O 5	S 1	0	0
17	V	1	Total 41	C 29	N 6	O 5	S 1	0	0
17	Y	1	Total 41	C 29	N 6	O 5	S 1	0	0



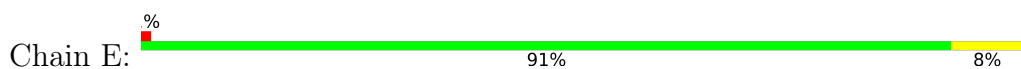
• Molecule 4: Proteasome subunit alpha type-5



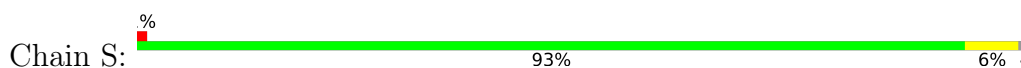
• Molecule 4: Proteasome subunit alpha type-5



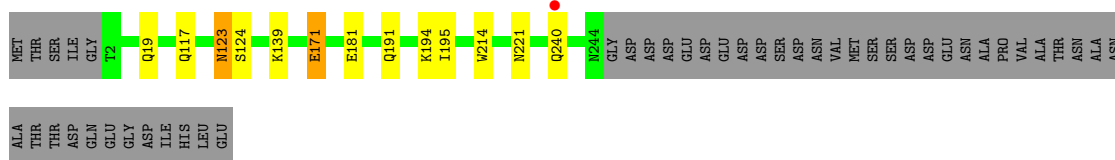
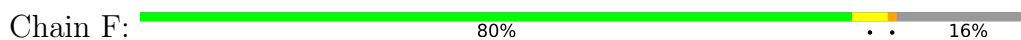
• Molecule 5: Proteasome subunit alpha type-6



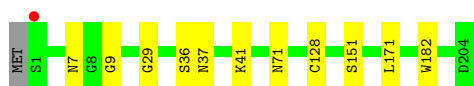
• Molecule 5: Proteasome subunit alpha type-6



• Molecule 6: Probable proteasome subunit alpha type-7



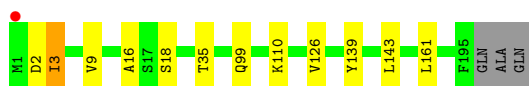
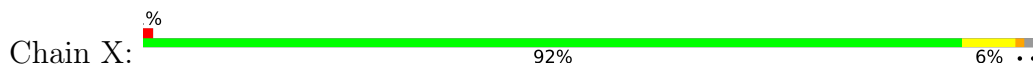
• Molecule 6: Probable proteasome subunit alpha type-7



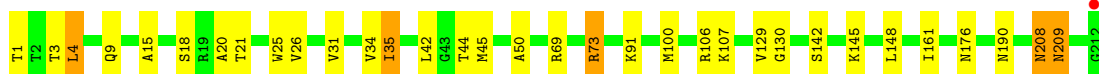
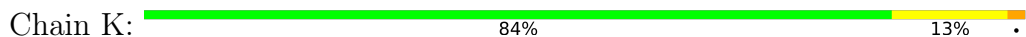
- Molecule 10: Proteasome subunit beta type-4



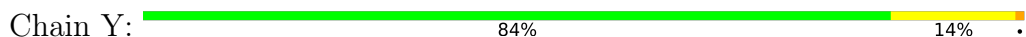
- Molecule 10: Proteasome subunit beta type-4



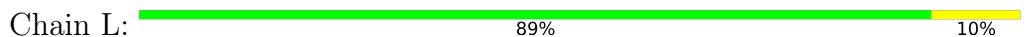
- Molecule 11: Proteasome subunit beta type-5



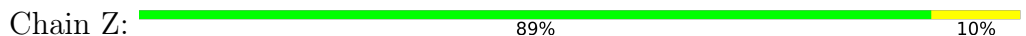
- Molecule 11: Proteasome subunit beta type-5



- Molecule 12: Proteasome subunit beta type-6



- Molecule 12: Proteasome subunit beta type-6




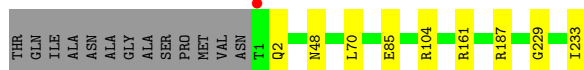
- Molecule 13: Proteasome subunit beta type-7

Chain M:  91% 5%



• Molecule 13: Proteasome subunit beta type-7

Chain a:  91% 5%



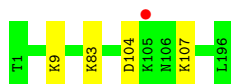
• Molecule 14: Proteasome subunit beta type-1

Chain N:  95% ..



• Molecule 14: Proteasome subunit beta type-1

Chain b:  98% .



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	134.07Å 302.11Å 143.22Å 90.00° 112.56° 90.00°	Depositor
Resolution (Å)	15.00 – 3.40 15.00 – 3.40	Depositor EDS
% Data completeness (in resolution range)	94.4 (15.00-3.40) 95.5 (15.00-3.40)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.15 (at 3.40Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.174 , 0.229 0.185 , 0.235	Depositor DCC
R_{free} test set	6795 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	94.8	Xtrriage
Anisotropy	0.176	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 51.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	49506	wwPDB-VP
Average B, all atoms (Å ²)	105.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.76% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, CL, GQQ

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	0.39	0/1952	0.60	0/2642
1	O	0.39	0/1952	0.59	0/2642
2	B	0.42	0/1934	0.68	2/2618 (0.1%)
2	P	0.41	0/1934	0.70	3/2618 (0.1%)
3	C	0.40	0/1910	0.65	0/2586
3	Q	0.39	0/1910	0.65	0/2586
4	D	0.38	0/1837	0.62	0/2475
4	R	0.38	0/1837	0.61	0/2475
5	E	0.38	0/1800	0.60	0/2433
5	S	0.37	0/1800	0.61	0/2433
6	F	0.39	0/1932	0.58	0/2609
6	T	0.38	0/1932	0.58	0/2609
7	G	0.41	0/1945	0.62	0/2634
7	U	0.41	0/1945	0.61	0/2634
8	H	0.39	0/1746	0.85	4/2365 (0.2%)
8	V	0.37	0/1718	0.87	3/2329 (0.1%)
9	I	0.40	0/1611	0.62	0/2174
9	W	0.40	0/1611	0.63	0/2174
10	J	0.40	0/1589	0.66	0/2142
10	X	0.41	0/1589	0.65	0/2142
11	K	0.40	0/1681	0.83	3/2274 (0.1%)
11	Y	0.41	0/1681	0.87	3/2274 (0.1%)
12	L	0.40	0/1795	0.64	0/2420
12	Z	0.41	0/1795	0.65	0/2420
13	M	0.40	0/1855	0.66	0/2514
13	a	0.40	0/1855	0.66	0/2514
14	N	0.38	0/1541	0.62	0/2087
14	b	0.37	0/1541	0.61	0/2087
All	All	0.39	0/50228	0.66	18/67910 (0.0%)

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
8	V	0	1
11	K	0	1
11	Y	0	1
All	All	0	3

There are no bond length outliers.

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	V	188	ARG	NE-CZ-NH2	-21.43	109.58	120.30
11	Y	73	ARG	NE-CZ-NH1	-20.25	110.17	120.30
8	H	188	ARG	NE-CZ-NH1	-18.51	111.05	120.30
11	K	73	ARG	NE-CZ-NH2	-18.30	111.15	120.30
11	Y	73	ARG	NE-CZ-NH2	17.80	129.20	120.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
11	K	73	ARG	Sidechain
8	V	188	ARG	Sidechain
11	Y	73	ARG	Sidechain

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	1915	0	1929	2	0
1	O	1915	0	1929	2	0
2	B	1904	0	1904	12	0
2	P	1904	0	1904	8	0
3	C	1881	0	1895	6	0
3	Q	1881	0	1895	7	0
4	D	1813	0	1797	5	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	R	1813	0	1797	7	0
5	E	1773	0	1775	8	0
5	S	1773	0	1775	6	0
6	F	1892	0	1883	5	0
6	T	1892	0	1883	4	0
7	G	1907	0	1901	3	0
7	U	1907	0	1901	3	0
8	H	1716	0	1702	10	0
8	V	1688	0	1682	11	0
9	I	1581	0	1574	5	0
9	W	1581	0	1574	7	0
10	J	1561	0	1569	7	0
10	X	1561	0	1569	7	0
11	K	1644	0	1594	23	0
11	Y	1644	0	1594	22	0
12	L	1757	0	1711	13	0
12	Z	1757	0	1711	15	0
13	M	1824	0	1832	0	0
13	a	1824	0	1832	0	0
14	N	1512	0	1481	3	0
14	b	1512	0	1481	0	0
15	G	1	0	0	0	0
15	I	1	0	0	0	0
15	K	1	0	0	0	0
15	N	1	0	0	0	0
15	V	1	0	0	0	0
15	W	1	0	0	0	0
15	Y	1	0	0	0	0
15	Z	1	0	0	0	0
16	G	1	0	0	0	0
16	U	1	0	0	0	0
17	H	41	0	0	1	0
17	K	41	0	0	2	0
17	V	41	0	0	2	0
17	Y	41	0	0	2	0
All	All	49506	0	49074	162	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 2.

The worst 5 of 162 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)
10:J:143:LEU:HD21	11:Y:142:SER:OG	1.69	0.92
5:S:92:ASN:HD21	12:Z:70:ASN:HD21	1.19	0.89
5:E:92:ASN:HD21	12:L:70:ASN:HD21	1.17	0.85
11:Y:44:THR:OG1	11:Y:100:MET:N	2.10	0.85
11:K:142:SER:OG	10:X:143:LEU:HD21	1.77	0.84

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	248/250 (99%)	241 (97%)	7 (3%)	0	100	100
1	O	248/250 (99%)	240 (97%)	8 (3%)	0	100	100
2	B	242/258 (94%)	232 (96%)	9 (4%)	1 (0%)	34	67
2	P	242/258 (94%)	231 (96%)	10 (4%)	1 (0%)	34	67
3	C	238/254 (94%)	235 (99%)	2 (1%)	1 (0%)	34	67
3	Q	238/254 (94%)	235 (99%)	2 (1%)	1 (0%)	34	67
4	D	231/260 (89%)	224 (97%)	7 (3%)	0	100	100
4	R	231/260 (89%)	224 (97%)	7 (3%)	0	100	100
5	E	229/234 (98%)	221 (96%)	8 (4%)	0	100	100
5	S	229/234 (98%)	221 (96%)	8 (4%)	0	100	100
6	F	241/288 (84%)	239 (99%)	2 (1%)	0	100	100
6	T	241/288 (84%)	238 (99%)	3 (1%)	0	100	100
7	G	239/252 (95%)	236 (99%)	3 (1%)	0	100	100
7	U	239/252 (95%)	237 (99%)	2 (1%)	0	100	100
8	H	224/226 (99%)	215 (96%)	8 (4%)	1 (0%)	34	67
8	V	221/226 (98%)	214 (97%)	7 (3%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
9	I	202/205 (98%)	194 (96%)	8 (4%)	0	100	100
9	W	202/205 (98%)	195 (96%)	7 (4%)	0	100	100
10	J	193/198 (98%)	189 (98%)	4 (2%)	0	100	100
10	X	193/198 (98%)	189 (98%)	3 (2%)	1 (0%)	29	61
11	K	210/212 (99%)	205 (98%)	5 (2%)	0	100	100
11	Y	210/212 (99%)	206 (98%)	4 (2%)	0	100	100
12	L	220/222 (99%)	212 (96%)	7 (3%)	1 (0%)	29	61
12	Z	220/222 (99%)	212 (96%)	7 (3%)	1 (0%)	29	61
13	M	231/246 (94%)	223 (96%)	7 (3%)	1 (0%)	34	67
13	a	231/246 (94%)	224 (97%)	6 (3%)	1 (0%)	34	67
14	N	194/196 (99%)	189 (97%)	5 (3%)	0	100	100
14	b	194/196 (99%)	189 (97%)	5 (3%)	0	100	100
All	All	6281/6602 (95%)	6110 (97%)	161 (3%)	10 (0%)	47	78

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	204	GLY
8	H	223	ILE
3	Q	204	GLY
12	Z	166	GLY
12	L	166	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	209/209 (100%)	205 (98%)	4 (2%)	57	78
1	O	209/209 (100%)	205 (98%)	4 (2%)	57	78
2	B	203/216 (94%)	194 (96%)	9 (4%)	28	58
2	P	203/216 (94%)	196 (97%)	7 (3%)	37	65

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	C	212/226 (94%)	201 (95%)	11 (5%)	23	53
3	Q	212/226 (94%)	201 (95%)	11 (5%)	23	53
4	D	194/215 (90%)	186 (96%)	8 (4%)	30	59
4	R	194/215 (90%)	186 (96%)	8 (4%)	30	59
5	E	190/193 (98%)	180 (95%)	10 (5%)	22	52
5	S	190/193 (98%)	181 (95%)	9 (5%)	26	57
6	F	201/239 (84%)	193 (96%)	8 (4%)	31	60
6	T	201/239 (84%)	193 (96%)	8 (4%)	31	60
7	G	206/210 (98%)	198 (96%)	8 (4%)	32	61
7	U	206/210 (98%)	198 (96%)	8 (4%)	32	61
8	H	184/184 (100%)	175 (95%)	9 (5%)	25	55
8	V	181/184 (98%)	174 (96%)	7 (4%)	32	61
9	I	172/173 (99%)	168 (98%)	4 (2%)	50	74
9	W	172/173 (99%)	168 (98%)	4 (2%)	50	74
10	J	173/175 (99%)	167 (96%)	6 (4%)	36	65
10	X	173/175 (99%)	168 (97%)	5 (3%)	42	69
11	K	169/169 (100%)	161 (95%)	8 (5%)	26	57
11	Y	169/169 (100%)	160 (95%)	9 (5%)	22	52
12	L	185/185 (100%)	177 (96%)	8 (4%)	29	59
12	Z	185/185 (100%)	177 (96%)	8 (4%)	29	59
13	M	199/208 (96%)	191 (96%)	8 (4%)	31	60
13	a	199/208 (96%)	191 (96%)	8 (4%)	31	60
14	N	162/162 (100%)	158 (98%)	4 (2%)	47	72
14	b	162/162 (100%)	158 (98%)	4 (2%)	47	72
All	All	5315/5528 (96%)	5110 (96%)	205 (4%)	32	61

5 of 205 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	P	238	LEU
5	S	208	ASP
13	a	187	ARG
3	Q	49	THR
4	R	193	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 125 such sidechains are listed below:

Mol	Chain	Res	Type
13	M	48	ASN
12	Z	29	ASN
2	P	176	GLN
12	Z	3	ASN
13	a	18	ASN

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](#)

Of 14 ligands modelled in this entry, 10 are monoatomic - leaving 4 for Mogul analysis.

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	$\# Z > 2$
17	GQQ	K	301	11	42,42,42	1.84	10 (23%)	55,57,57	2.10	16 (29%)
17	GQQ	H	301	8	42,42,42	1.76	9 (21%)	55,57,57	1.55	10 (18%)
17	GQQ	V	301	8	42,42,42	1.76	8 (19%)	55,57,57	1.57	11 (20%)
17	GQQ	Y	301	11	42,42,42	1.85	10 (23%)	55,57,57	1.88	14 (25%)

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
17	GQQ	K	301	11	-	3/44/44/44	0/2/2/2
17	GQQ	H	301	8	-	2/44/44/44	0/2/2/2
17	GQQ	V	301	8	-	2/44/44/44	0/2/2/2
17	GQQ	Y	301	11	-	3/44/44/44	0/2/2/2

The worst 5 of 37 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	K	301	GQQ	C16-C17	-5.19	1.38	1.51
17	Y	301	GQQ	C16-C17	-5.04	1.39	1.51
17	V	301	GQQ	C16-C17	-4.94	1.39	1.51
17	V	301	GQQ	C6-C7	-4.86	1.38	1.50
17	H	301	GQQ	C16-C17	-4.83	1.39	1.51

The worst 5 of 51 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	K	301	GQQ	O30-S27-C26	9.48	114.98	108.34
17	Y	301	GQQ	O30-S27-C26	8.11	114.03	108.34
17	H	301	GQQ	O30-S27-O29	-5.80	104.70	117.09
17	V	301	GQQ	O30-S27-O29	-5.55	105.23	117.09
17	Y	301	GQQ	O30-S27-O29	-4.23	108.05	117.09

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

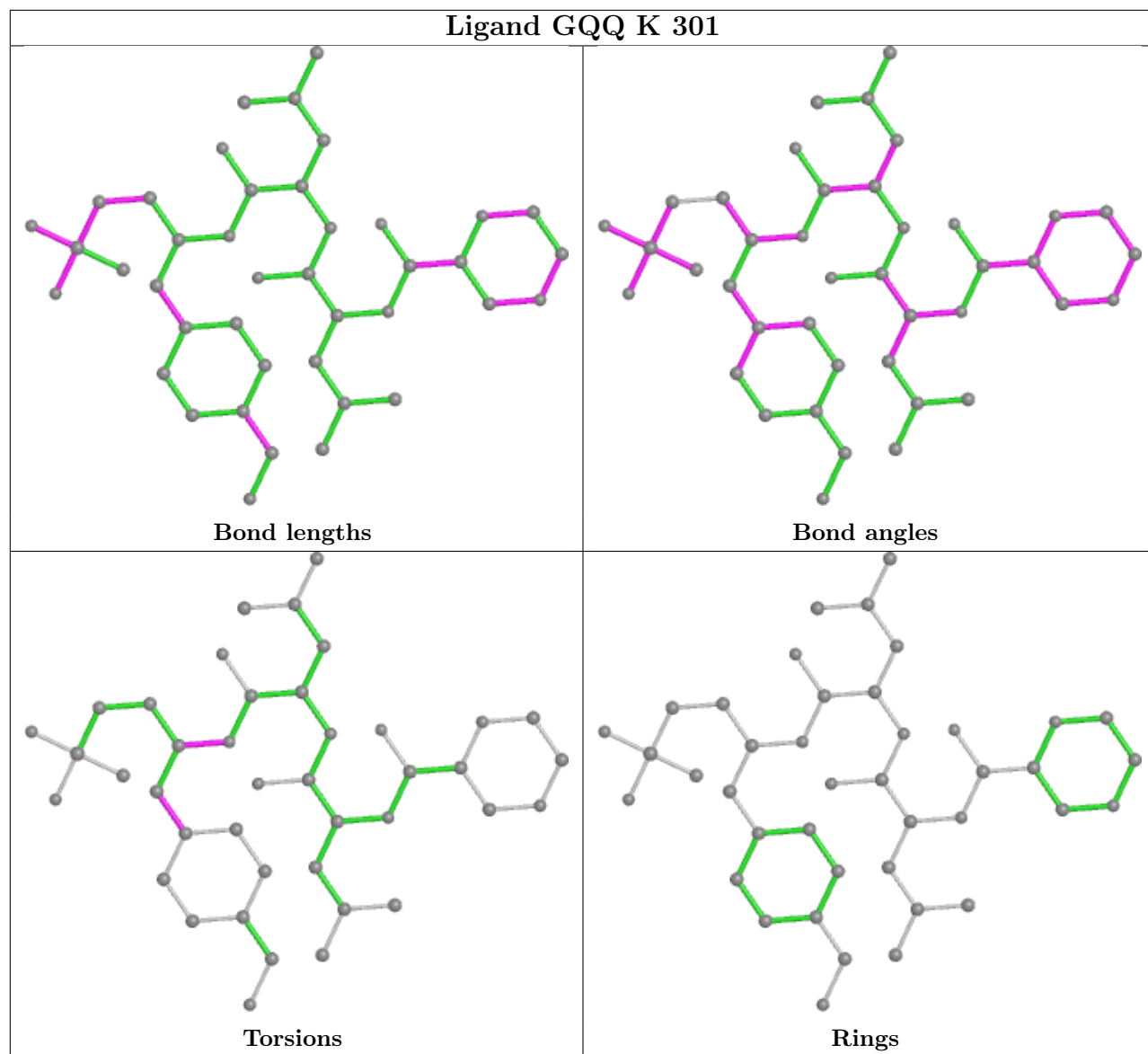
Mol	Chain	Res	Type	Atoms
17	H	301	GQQ	C15-C16-C17-C24
17	Y	301	GQQ	C15-C16-C17-C24
17	K	301	GQQ	C15-C16-C17-C24
17	V	301	GQQ	C15-C16-C17-C24
17	Y	301	GQQ	C15-C16-C17-C18

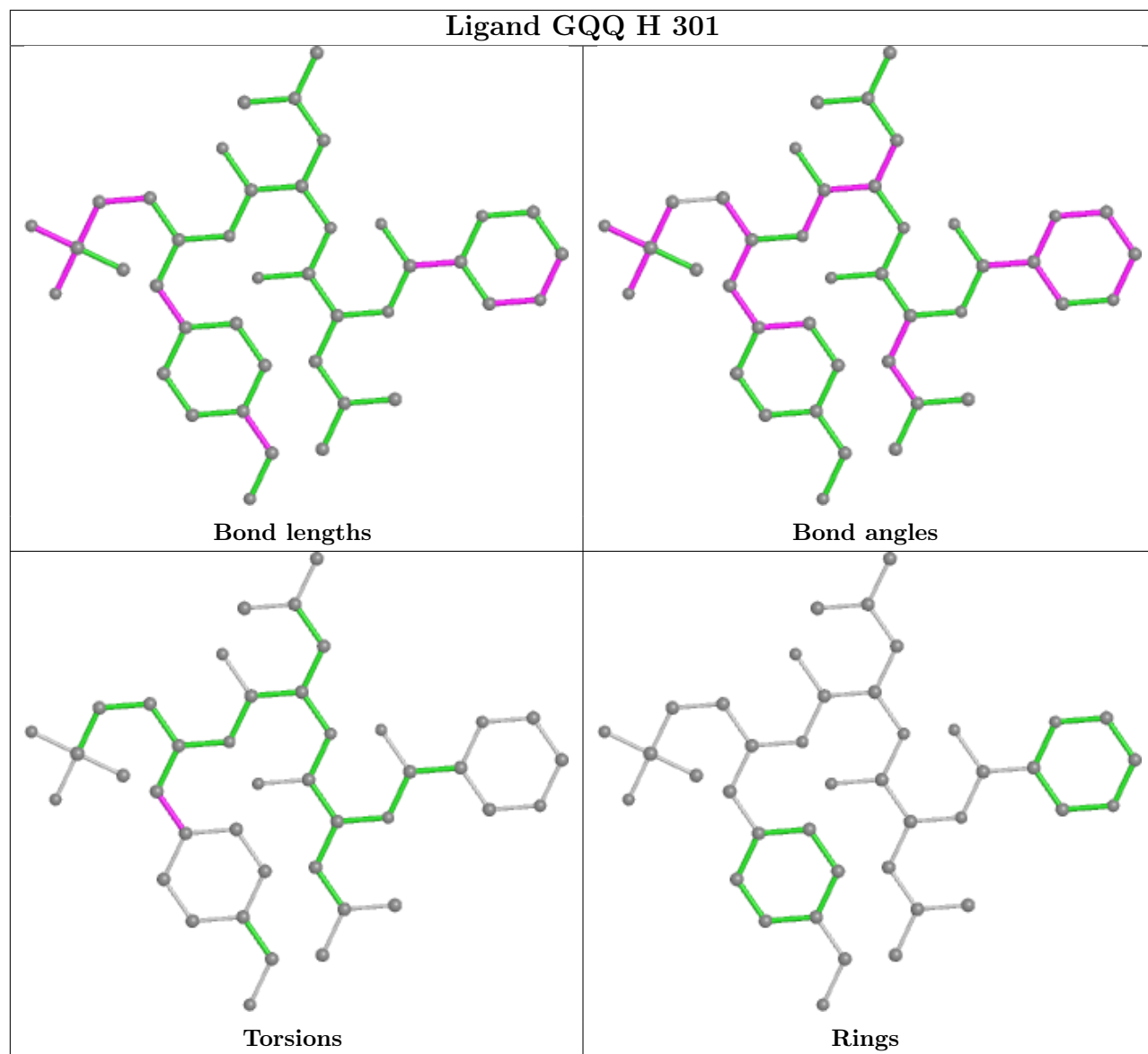
There are no ring outliers.

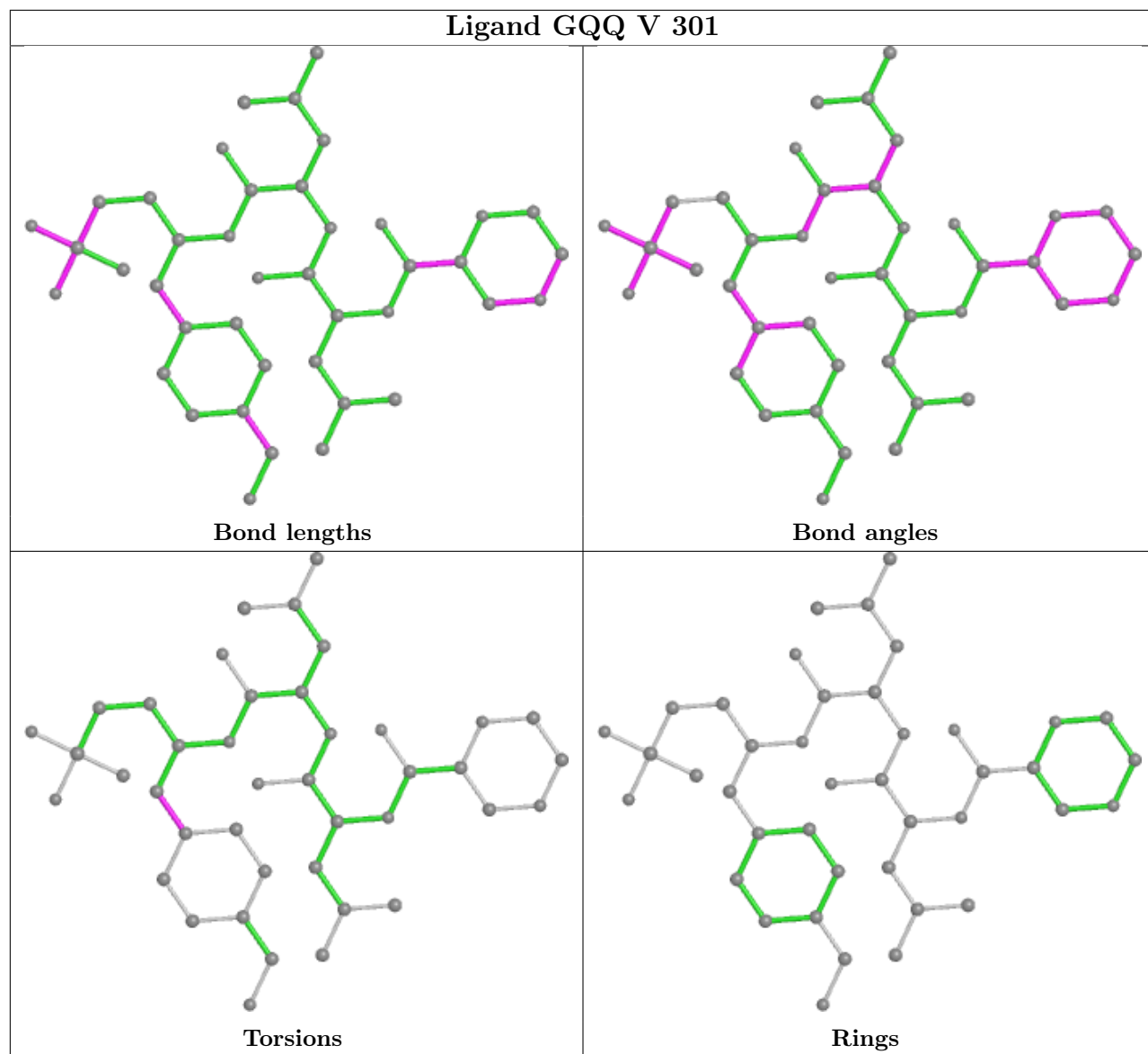
4 monomers are involved in 7 short contacts:

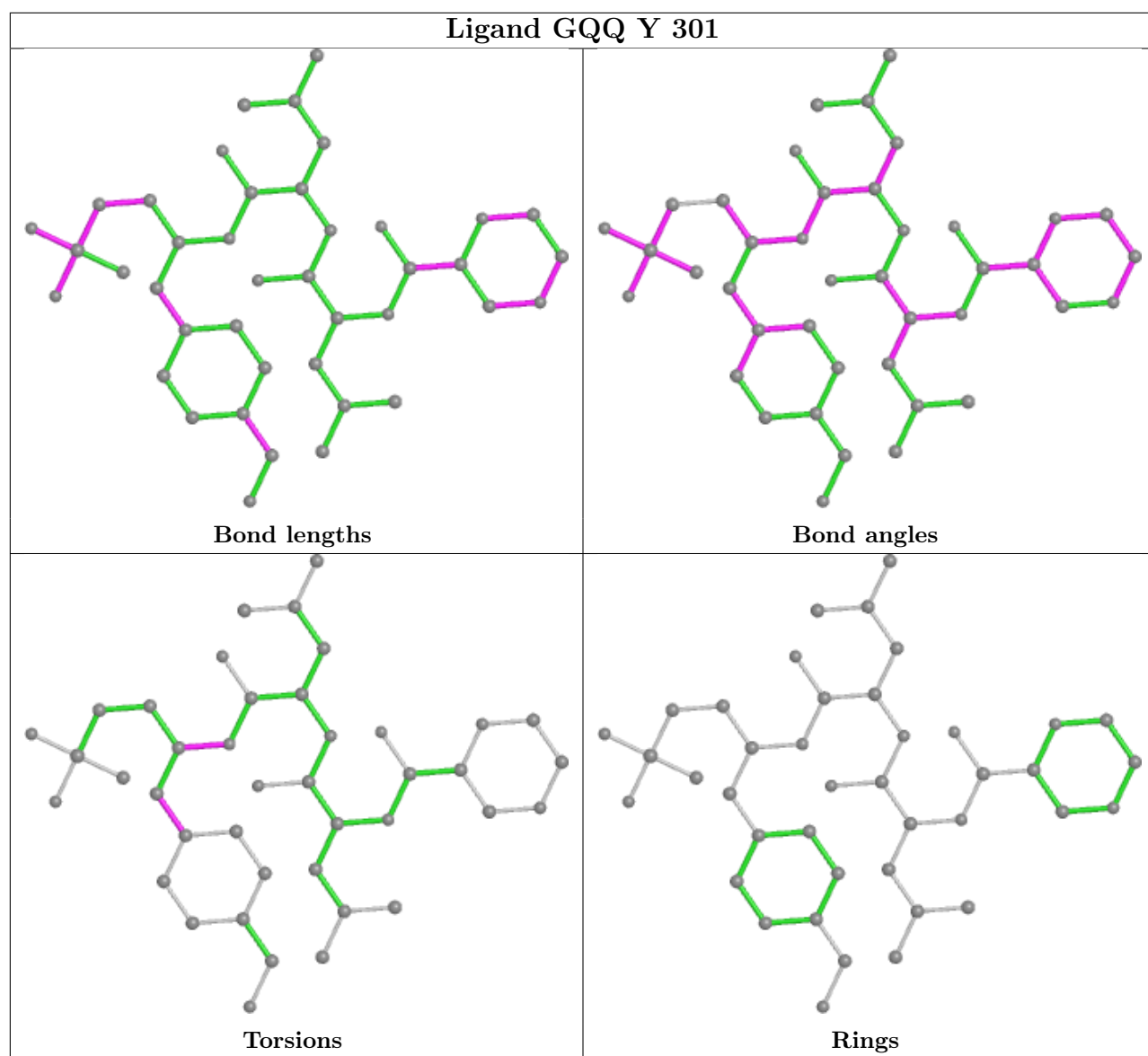
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	K	301	GQQ	2	0
17	H	301	GQQ	1	0
17	V	301	GQQ	2	0
17	Y	301	GQQ	2	0

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









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [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	250/250 (100%)	-0.44	1 (0%) 92 92	79, 99, 138, 157	0
1	O	250/250 (100%)	-0.36	4 (1%) 72 70	84, 106, 147, 178	0
2	B	244/258 (94%)	-0.41	3 (1%) 79 77	77, 102, 144, 175	0
2	P	244/258 (94%)	-0.39	6 (2%) 57 55	84, 105, 146, 165	0
3	C	240/254 (94%)	-0.39	2 (0%) 86 85	79, 107, 155, 182	0
3	Q	240/254 (94%)	-0.21	8 (3%) 46 45	88, 120, 187, 215	0
4	D	235/260 (90%)	-0.44	0 100 100	88, 109, 136, 166	0
4	R	235/260 (90%)	-0.34	3 (1%) 77 76	96, 113, 145, 192	0
5	E	231/234 (98%)	-0.30	3 (1%) 77 76	88, 113, 149, 168	0
5	S	231/234 (98%)	-0.26	3 (1%) 77 76	85, 121, 167, 186	0
6	F	243/288 (84%)	-0.43	1 (0%) 92 92	77, 105, 149, 169	0
6	T	243/288 (84%)	-0.48	2 (0%) 86 85	82, 109, 159, 186	0
7	G	241/252 (95%)	-0.56	1 (0%) 92 92	77, 97, 129, 158	0
7	U	241/252 (95%)	-0.43	2 (0%) 86 85	82, 101, 133, 168	0
8	H	226/226 (100%)	-0.48	5 (2%) 62 60	74, 91, 130, 192	0
8	V	223/226 (98%)	-0.51	2 (0%) 84 83	76, 96, 126, 170	0
9	I	204/205 (99%)	-0.66	0 100 100	72, 90, 115, 139	0
9	W	204/205 (99%)	-0.66	1 (0%) 91 90	78, 94, 120, 138	0
10	J	195/198 (98%)	-0.58	1 (0%) 91 90	72, 91, 116, 130	0
10	X	195/198 (98%)	-0.55	1 (0%) 91 90	78, 96, 118, 142	0
11	K	212/212 (100%)	-0.56	1 (0%) 91 90	81, 98, 125, 137	0
11	Y	212/212 (100%)	-0.58	1 (0%) 91 90	77, 94, 123, 138	0
12	L	222/222 (100%)	-0.54	0 100 100	78, 98, 129, 147	0
12	Z	222/222 (100%)	-0.57	1 (0%) 91 90	72, 93, 130, 143	0

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
13	M	233/246 (94%)	-0.56	1 (0%) 92 92	75, 94, 119, 135	0
13	a	233/246 (94%)	-0.58	1 (0%) 92 92	67, 91, 116, 134	0
14	N	196/196 (100%)	-0.62	0 100 100	71, 87, 115, 130	0
14	b	196/196 (100%)	-0.62	1 (0%) 91 90	72, 88, 118, 135	0
All	All	6341/6602 (96%)	-0.48	55 (0%) 84 83	67, 100, 145, 215	0

The worst 5 of 55 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	221	ASP	7.6
8	H	224	GLN	7.3
8	V	223	ILE	5.1
8	H	226	GLU	5.0
2	B	220	ASN	4.7

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.

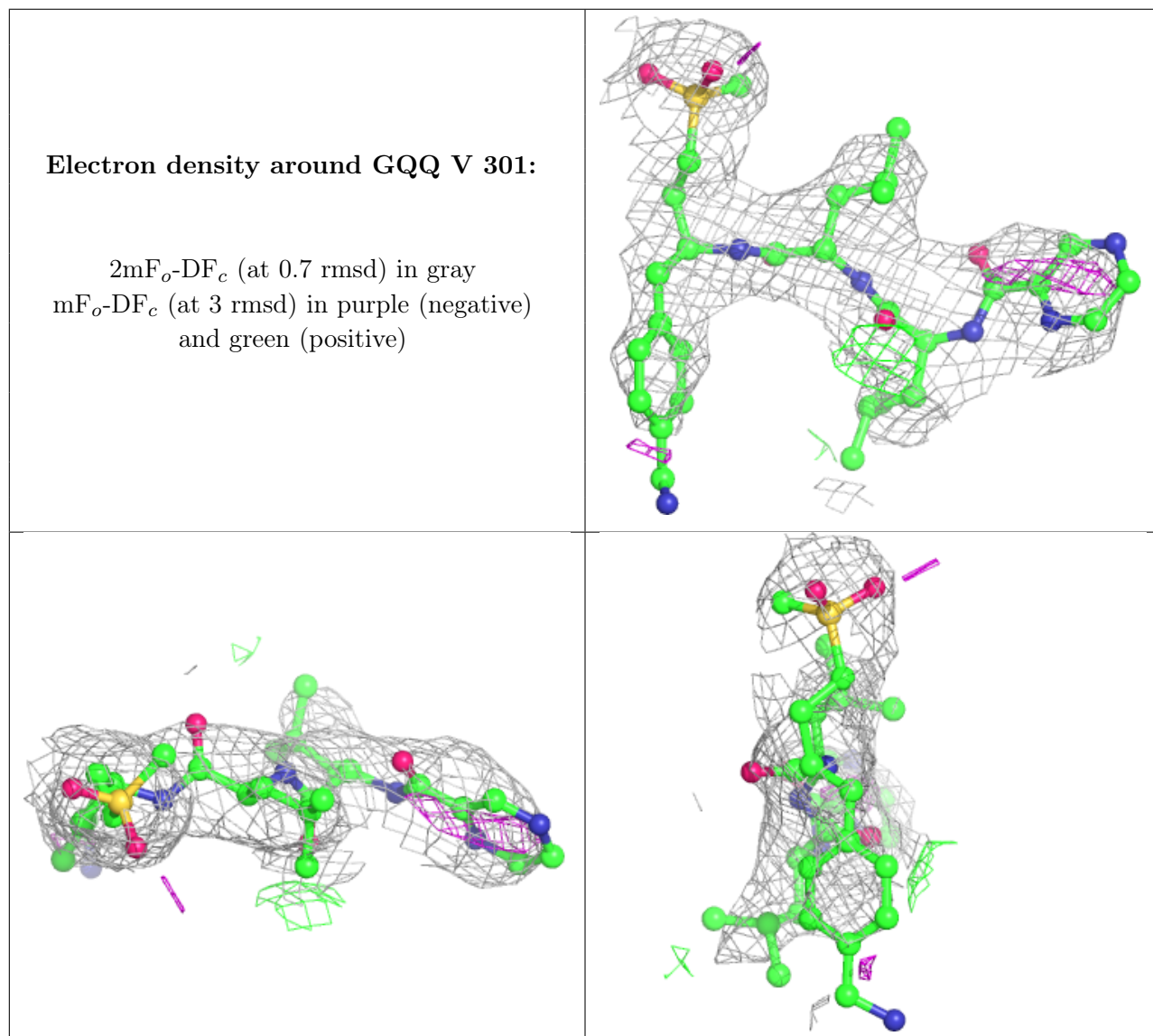
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
15	MG	N	201	1/1	0.89	0.50	79,79,79,79	0
17	GQQ	V	301	41/41	0.90	0.23	68,104,115,121	0
15	MG	V	302	1/1	0.91	0.10	107,107,107,107	0
17	GQQ	H	301	41/41	0.91	0.21	66,101,112,121	0
15	MG	I	301	1/1	0.91	0.36	107,107,107,107	0
17	GQQ	Y	301	41/41	0.91	0.24	79,94,107,112	0
16	CL	U	301	1/1	0.92	0.39	91,91,91,91	0

Continued on next page...

Continued from previous page...

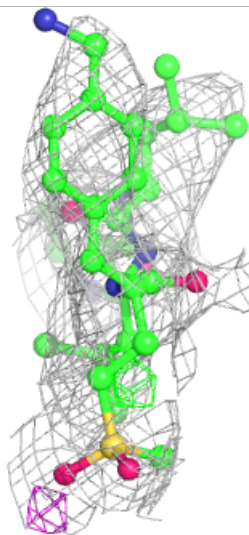
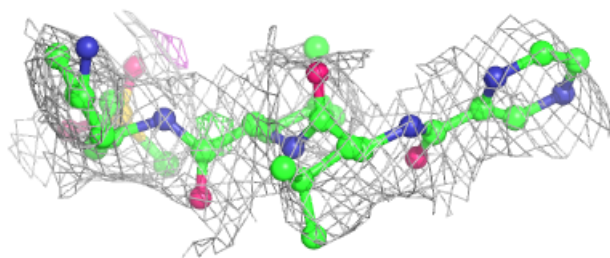
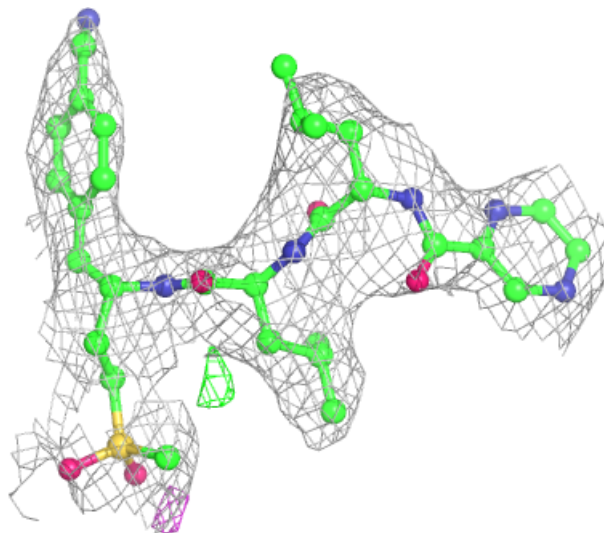
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
15	MG	G	301	1/1	0.92	0.10	78,78,78,78	0
17	GQQ	K	301	41/41	0.93	0.22	74,97,103,111	0
15	MG	K	302	1/1	0.93	0.26	150,150,150,150	0
15	MG	Z	301	1/1	0.93	0.21	90,90,90,90	0
15	MG	Y	302	1/1	0.94	0.20	130,130,130,130	0
15	MG	W	301	1/1	0.95	0.21	75,75,75,75	0
16	CL	G	302	1/1	0.98	0.30	84,84,84,84	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.



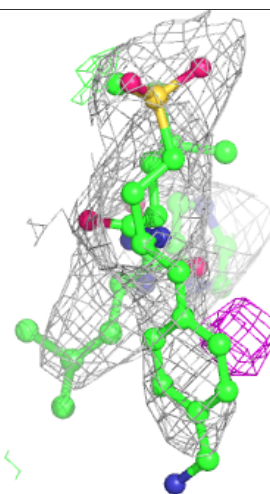
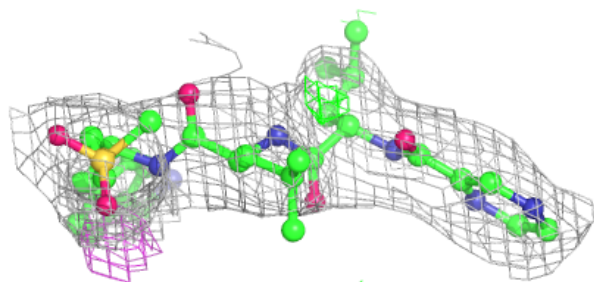
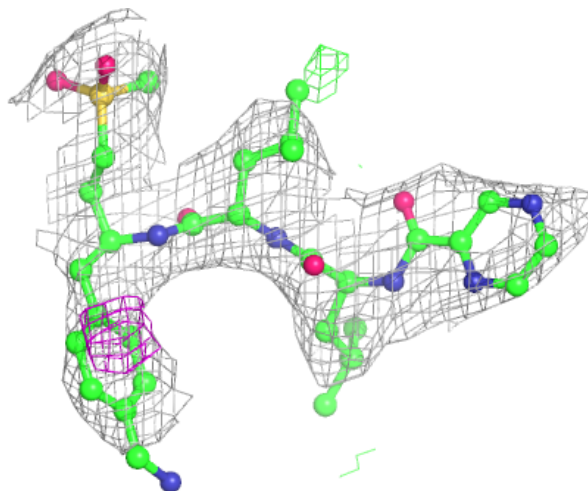
Electron density around GQQ H 301:

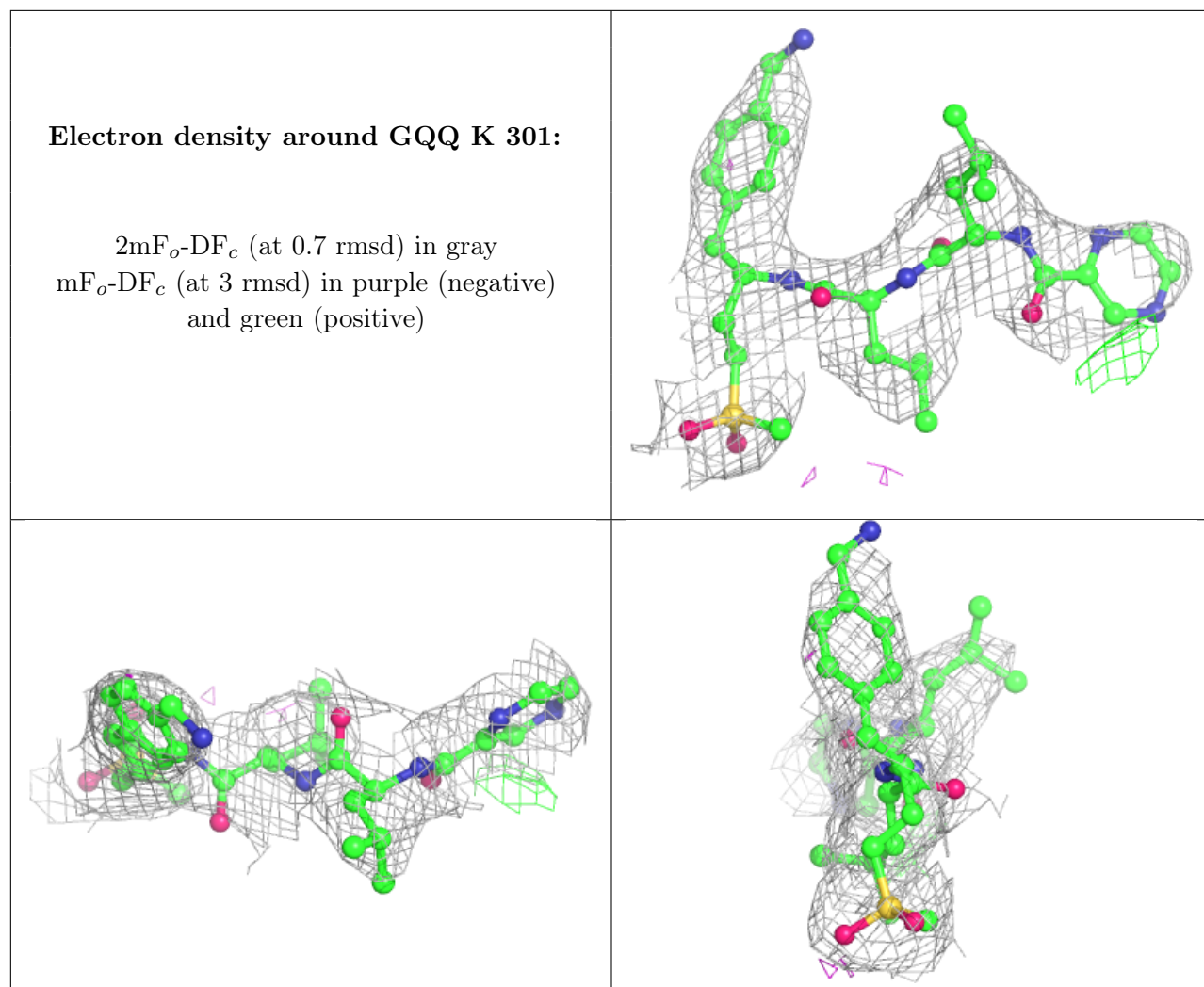
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around GQQ Y 301:

$2mF_o-DF_c$ (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.