



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 07:57 AM UTC

PDB ID : 5I4O / pdb_00005i4o
Title : Crystal structure of the catalytic domain of MMP-12 in complex with a selective sugar-conjugated triazole-linked carboxylate zinc-chelator water-soluble inhibitor (DC28).
Authors : Stura, E.A.; Rosalia, L.; Cuffaro, D.; Tepshi, L.; Ciccone, L.; Rossello, A.
Deposited on : 2016-02-12
Resolution : 2.05 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The 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:

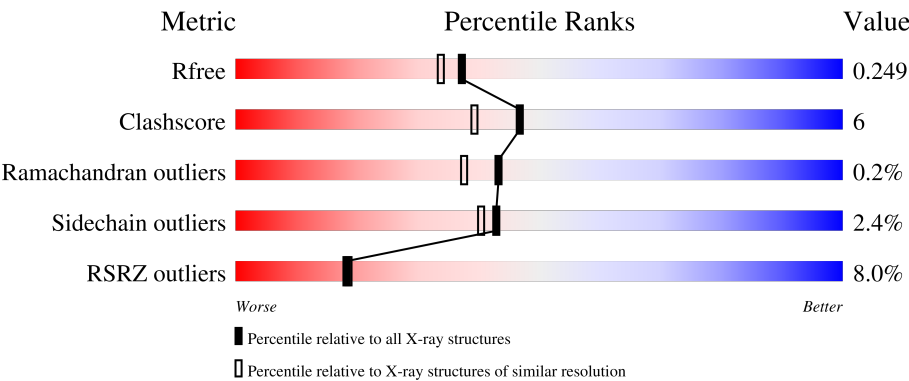
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 i

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

The reported resolution of this entry is 2.05 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	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

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	159	2% 87% 11%
1	B	159	14% 74% 23%
1	C	159	% 84% 14%
1	D	159	14% 73% 23%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 5591 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.

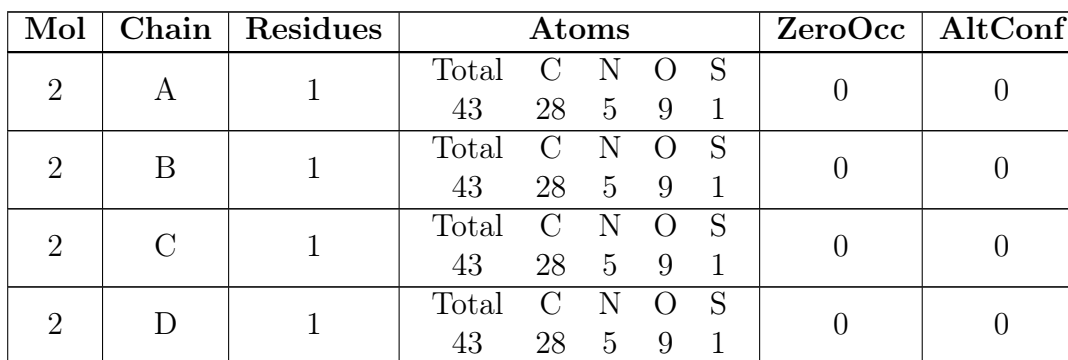
- Molecule 1 is a protein called Macrophage metalloelastase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	156	Total	C	N	O	S	0	0	0
			1227	782	215	227	3			
1	B	156	Total	C	N	O	S	0	0	0
			1227	782	215	227	3			
1	C	156	Total	C	N	O	S	0	1	0
			1236	787	216	230	3			
1	D	156	Total	C	N	O	S	0	1	0
			1236	788	217	228	3			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	105	MET	-	initiating methionine	UNP P39900
A	171	ASP	PHE	conflict	UNP P39900
A	219	GLN	GLU	conflict	UNP P39900
B	105	MET	-	initiating methionine	UNP P39900
B	171	ASP	PHE	conflict	UNP P39900
B	219	GLN	GLU	conflict	UNP P39900
C	105	MET	-	initiating methionine	UNP P39900
C	171	ASP	PHE	conflict	UNP P39900
C	219	GLN	GLU	conflict	UNP P39900
D	105	MET	-	initiating methionine	UNP P39900
D	171	ASP	PHE	conflict	UNP P39900
D	219	GLN	GLU	conflict	UNP P39900

- Molecule 2 is N-({1-[2-(acetylamino)-2-deoxy-beta-D-glucopyranosyl]-1H-1,2,3-triazol-4-yl} methyl)-N-([1,1'-biphenyl]-4-yl)sulfonyl]-D-valine (CCD ID: V28) (formula: C₂₈H₃₅N₅O₉S).



- | Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|-----|-------|----------|-----------------|---------|---------|
| 3 | A | 2 | Total Zn
2 2 | 0 | 0 |
| 3 | B | 2 | Total Zn
2 2 | 0 | 0 |
| 3 | C | 2 | Total Zn
2 2 | 0 | 0 |
| 3 | D | 2 | Total Zn
2 2 | 0 | 0 |

- | Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|-----|-------|----------|-----------------|---------|---------|
| 4 | A | 3 | Total Ca
3 3 | 0 | 0 |



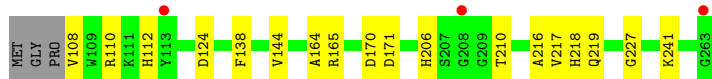
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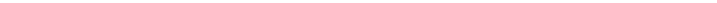
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	3	Total 3	Ca 3	0	0
4	C	3	Total 3	Ca 3	0	0
4	D	3	Total 3	Ca 3	0	0

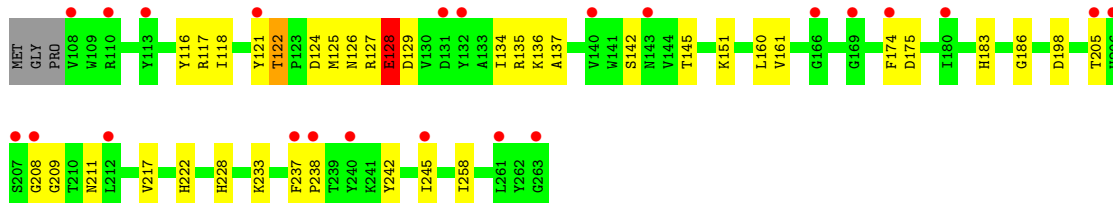
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	139	Total 139	O 139	0	0
5	B	100	Total 102	O 102	0	2
5	C	133	Total 135	O 135	0	2
5	D	94	Total 97	O 97	0	3

- Molecule 1: Macrophage metalloelastase

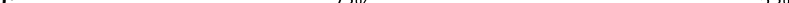


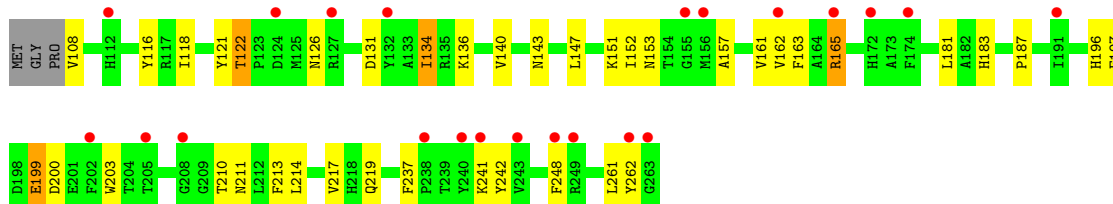
Chain B:  14% 74% 23% ..



Chain C:  84% 14% 2%



Chain D:  14% 73% 23% .



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	63.98Å 63.51Å 78.64Å 90.00° 102.31° 90.00°	Depositor
Resolution (Å)	32.87 – 2.05 32.87 – 2.05	Depositor EDS
% Data completeness (in resolution range)	98.6 (32.87-2.05) 98.6 (32.87-2.05)	Depositor EDS
R_{merge}	0.23	Depositor
R_{sym}	0.21	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.96 (at 2.05Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, R_{free}	0.210 , 0.249 0.211 , 0.249	Depositor DCC
R_{free} test set	1917 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	18.4	Xtriage
Anisotropy	0.072	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 67.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	5591	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 41.65 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.2901e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: V28, CA, ZN

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	1.57	12/1263 (1.0%)	1.16	4/1711 (0.2%)
1	B	1.09	2/1263 (0.2%)	1.27	13/1711 (0.8%)
1	C	1.54	11/1272 (0.9%)	1.11	0/1723
1	D	1.04	0/1272	1.15	8/1722 (0.5%)
All	All	1.33	25/5070 (0.5%)	1.18	25/6867 (0.4%)

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	133	ALA	N-CA	7.91	1.55	1.46
1	A	227	GLY	C-O	6.77	1.30	1.24
1	A	165	ARG	N-CA	6.60	1.53	1.45
1	A	206	HIS	C-O	6.59	1.28	1.23
1	C	160	LEU	CA-C	-6.51	1.44	1.52
1	C	227	GLY	C-O	6.35	1.29	1.24
1	C	243	VAL	CA-C	6.22	1.59	1.52
1	A	144	VAL	N-CA	5.97	1.52	1.46
1	A	216	ALA	C-O	-5.97	1.17	1.24
1	A	164	ALA	N-CA	5.57	1.53	1.45
1	C	216	ALA	C-O	-5.50	1.17	1.24
1	C	213	PHE	CA-CB	5.44	1.61	1.53
1	A	138	PHE	N-CA	5.42	1.53	1.46
1	B	136	LYS	C-O	5.41	1.30	1.24
1	C	162	VAL	N-CA	5.33	1.52	1.46
1	A	171	ASP	N-CA	5.22	1.53	1.46
1	A	170	ASP	CA-CB	5.20	1.61	1.53
1	A	218	HIS	C-O	5.20	1.30	1.24
1	A	219	GLN	N-CA	5.15	1.52	1.46
1	B	175	ASP	CA-C	5.14	1.59	1.52
1	C	220	ILE	CA-CB	5.12	1.60	1.54
1	C	203	TRP	N-CA	5.06	1.52	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	217	VAL	C-O	5.04	1.29	1.24
1	C	135	ARG	C-O	-5.03	1.18	1.24
1	C	195	ALA	CA-C	5.00	1.58	1.52

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	124	ASP	N-CA-C	6.76	119.48	111.71
1	B	122	THR	CA-C-N	-6.37	113.06	120.12
1	B	122	THR	C-N-CA	-6.37	113.06	120.12
1	D	237	PHE	CA-C-N	6.31	126.00	119.56
1	D	237	PHE	C-N-CA	6.31	126.00	119.56
1	A	112	HIS	CB-CA-C	6.24	119.86	109.38
1	B	208	GLY	N-CA-C	-6.20	104.80	111.93
1	D	248	PHE	N-CA-C	6.20	119.81	110.64
1	B	126	ASN	N-CA-C	-6.14	101.84	110.50
1	B	128	GLU	N-CA-CB	5.99	118.86	109.94
1	B	222	HIS	N-CA-C	5.95	117.44	111.07
1	B	128	GLU	CB-CG-CD	5.94	122.69	112.60
1	A	227	GLY	N-CA-C	-5.94	104.11	112.60
1	D	126	ASN	CA-C-N	5.73	127.96	120.28
1	D	126	ASN	C-N-CA	5.73	127.96	120.28
1	B	237	PHE	CA-C-N	-5.61	114.10	120.89
1	B	237	PHE	C-N-CA	-5.61	114.10	120.89
1	D	217	VAL	CB-CA-C	-5.61	104.57	112.14
1	D	134	ILE	N-CA-CB	5.45	116.56	110.62
1	B	127	ARG	N-CA-C	5.31	120.13	111.37
1	D	126	ASN	CA-C-O	-5.28	115.95	121.55
1	A	210	THR	N-CA-C	-5.25	99.85	108.41
1	B	205	THR	N-CA-C	-5.19	107.50	113.88
1	B	186	GLY	CA-C-N	5.08	125.08	119.90
1	B	186	GLY	C-N-CA	5.08	125.08	119.90

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	1227	0	1159	2	0
1	B	1227	0	1159	22	0
1	C	1236	0	1164	7	0
1	D	1236	0	1171	24	0
2	A	43	0	0	0	0
2	B	43	0	0	0	0
2	C	43	0	0	0	0
2	D	43	0	0	1	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
4	A	3	0	0	0	0
4	B	3	0	0	0	0
4	C	3	0	0	0	0
4	D	3	0	0	0	0
5	A	139	0	0	1	0
5	B	102	0	0	5	0
5	C	135	0	0	2	0
5	D	97	0	0	4	0
All	All	5591	0	4653	56	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 (56) 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:B:118:ILE:HD12	1:B:151:LYS:HZ3	1.30	0.96
1:B:211:ASN:HD22	1:B:242:TYR:HE1	1.26	0.79
1:B:118:ILE:HD12	1:B:151:LYS:NZ	1.99	0.77
1:C:108:VAL:N	5:C:645[B]:HOH:O	2.20	0.73
1:B:211:ASN:ND2	1:B:242:TYR:HE1	1.88	0.71
1:D:200:ASP:O	5:D:601:HOH:O	2.12	0.68
1:B:211:ASN:HA	5:B:608:HOH:O	1.94	0.67
1:D:165:ARG:HD3	1:D:200:ASP:OD1	1.95	0.66
1:B:128:GLU:OE1	5:B:601:HOH:O	2.13	0.66
1:D:122:THR:HB	1:D:199:GLU:OE1	1.96	0.65
1:A:108:VAL:N	5:A:601:HOH:O	2.30	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:134:ILE:HD13	1:B:161:VAL:HG11	1.86	0.57
1:D:161:VAL:HG13	1:D:197:PHE:HE1	1.70	0.56
1:D:136:LYS:O	1:D:140:VAL:HG23	2.06	0.56
1:D:116:TYR:HE1	5:D:650:HOH:O	1.89	0.55
1:D:211:ASN:ND2	1:D:242:TYR:HE1	2.05	0.55
1:B:211:ASN:ND2	1:B:245:ILE:HD11	2.22	0.55
1:D:211:ASN:ND2	1:D:242:TYR:CE1	2.75	0.55
1:D:151:LYS:NZ	1:D:153:ASN:OD1	2.40	0.55
1:D:108:VAL:HA	1:D:187:PRO:HG2	1.88	0.54
1:B:228:HIS:CE1	1:B:238:PRO:HB3	2.43	0.53
1:D:121:TYR:OH	1:D:131:ASP:OD1	2.27	0.51
1:D:118:ILE:HD11	5:D:650:HOH:O	2.10	0.51
1:B:135:ARG:NH1	5:B:602:HOH:O	2.31	0.50
1:B:211:ASN:ND2	1:B:242:TYR:CE1	2.76	0.50
1:C:112:HIS:CE1	1:C:146:PRO:HG2	2.48	0.49
1:B:116:TYR:HE2	5:B:615[B]:HOH:O	1.96	0.48
1:B:125:MET:HE3	1:B:129:ASP:HB3	1.96	0.48
1:D:213:PHE:CD2	1:D:214:LEU:HD23	2.49	0.48
1:C:177:LYS:NZ	5:C:604:HOH:O	2.48	0.46
1:D:161:VAL:HG13	1:D:197:PHE:CE1	2.48	0.46
2:D:301:V28:C24	2:D:301:V28:C23	2.94	0.46
1:C:128[B]:GLU:HG3	1:C:129:ASP:N	2.30	0.46
1:D:152:ILE:HD11	1:D:157:ALA:HB2	1.97	0.46
1:B:117:ARG:O	1:B:160:LEU:HD12	2.16	0.46
1:A:110:ARG:HE	1:A:110:ARG:HB2	1.55	0.45
1:B:118:ILE:HD11	1:B:134:ILE:HD12	1.98	0.45
1:B:121:TYR:CD1	1:B:121:TYR:N	2.85	0.45
1:B:134:ILE:HB	5:B:615[B]:HOH:O	2.18	0.44
1:D:163:PHE:HB3	1:D:199:GLU:HG2	1.99	0.44
1:D:162:VAL:HB	1:D:196:HIS:CD2	2.53	0.43
1:B:134:ILE:O	1:B:137:ALA:HB3	2.19	0.43
1:D:147:LEU:HD21	1:D:262:TYR:CD1	2.54	0.42
1:C:151:LYS:NZ	1:C:153:ASN:OD1	2.53	0.42
1:D:181:LEU:HD13	1:D:210:THR:HG21	2.01	0.42
1:C:170:ASP:O	1:C:171:ASP:HB2	2.20	0.42
1:D:108:VAL:HG11	1:D:261:LEU:HB3	2.02	0.41
1:B:211:ASN:HD21	1:B:245:ILE:HD11	1.85	0.41
1:B:137:ALA:HA	1:B:217:VAL:HG22	2.02	0.41
1:B:145:THR:HG21	1:B:258:ILE:HG13	2.02	0.41
1:B:174:PHE:CG	1:B:198:ASP:HB2	2.55	0.41
1:D:134:ILE:HB	5:D:650:HOH:O	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:116:TYR:CZ	1:C:151:LYS:HB2	2.56	0.41
1:D:122:THR:CB	1:D:199:GLU:OE1	2.67	0.41
1:D:197:PHE:HB3	1:D:203:TRP:CZ2	2.56	0.41
1:D:183:HIS:HA	1:D:219:GLN:OE1	2.21	0.41

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	154/159 (97%)	149 (97%)	5 (3%)	0	100	100
1	B	154/159 (97%)	142 (92%)	11 (7%)	1 (1%)	21	13
1	C	155/159 (98%)	150 (97%)	5 (3%)	0	100	100
1	D	155/159 (98%)	145 (94%)	10 (6%)	0	100	100
All	All	618/636 (97%)	586 (95%)	31 (5%)	1 (0%)	43	37

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	209	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	126/128 (98%)	125 (99%)	1 (1%)	73	77
1	B	126/128 (98%)	120 (95%)	6 (5%)	23	16
1	C	127/128 (99%)	127 (100%)	0	100	100
1	D	127/128 (99%)	121 (95%)	6 (5%)	23	17
All	All	506/512 (99%)	493 (97%)	13 (3%)	43	37

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	241	LYS
1	B	122	THR
1	B	124	ASP
1	B	128	GLU
1	B	142	SER
1	B	183	HIS
1	B	233	LYS
1	D	122	THR
1	D	143	ASN
1	D	165	ARG
1	D	199	GLU
1	D	241[A]	LYS
1	D	241[B]	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	172	HIS
1	B	119	ASN
1	B	139	GLN
1	B	211	ASN
1	C	126	ASN
1	C	172	HIS
1	D	172	HIS
1	D	206	HIS
1	D	259	GLN

5.3.3 RNA ⓘ

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 24 ligands modelled in this entry, 20 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$
2	V28	D	301	3	43,46,46	2.54	5 (11%)	63,67,67	2.16	15 (23%)
2	V28	B	301	3	43,46,46	2.65	5 (11%)	63,67,67	2.13	19 (30%)
2	V28	A	301	3	43,46,46	2.38	7 (16%)	63,67,67	1.79	17 (26%)
2	V28	C	301	3	43,46,46	2.45	6 (13%)	63,67,67	2.09	21 (33%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	V28	D	301	3	-	6/42/62/62	0/4/4/4
2	V28	B	301	3	-	5/42/62/62	0/4/4/4
2	V28	A	301	3	-	2/42/62/62	0/4/4/4
2	V28	C	301	3	-	6/42/62/62	0/4/4/4

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	301	V28	C10-S13	-13.10	1.58	1.76

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	301	V28	C10-S13	-12.21	1.60	1.76
2	C	301	V28	C10-S13	-11.25	1.61	1.76
2	A	301	V28	C10-S13	-11.02	1.61	1.76
2	D	301	V28	S13-N16	-8.47	1.50	1.63
2	C	301	V28	S13-N16	-8.28	1.50	1.63
2	B	301	V28	S13-N16	-7.95	1.51	1.63
2	A	301	V28	S13-N16	-7.82	1.51	1.63
2	B	301	V28	N26-N27	4.93	1.40	1.32
2	C	301	V28	N26-N27	4.66	1.39	1.32
2	D	301	V28	N26-N27	4.60	1.39	1.32
2	B	301	V28	N28-N27	4.54	1.41	1.35
2	A	301	V28	N26-N27	4.33	1.39	1.32
2	C	301	V28	N28-N27	3.11	1.39	1.35
2	A	301	V28	O15-S13	-3.10	1.40	1.43
2	C	301	V28	O14-S13	-2.96	1.40	1.43
2	D	301	V28	C17-C18	-2.78	1.49	1.53
2	A	301	V28	N28-N27	2.72	1.38	1.35
2	D	301	V28	N28-N27	2.71	1.38	1.35
2	C	301	V28	C30-N28	2.21	1.50	1.46
2	B	301	V28	C30-N28	2.20	1.50	1.46
2	A	301	V28	O14-S13	-2.16	1.41	1.43
2	A	301	V28	C24-C25	2.04	1.52	1.50

All (72) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	301	V28	O14-S13-O15	-7.46	107.95	119.59
2	B	301	V28	O14-S13-O15	-6.91	108.80	119.59
2	D	301	V28	O14-S13-O15	-6.34	109.69	119.59
2	D	301	V28	O20-C18-C17	6.34	122.43	111.92
2	D	301	V28	O19-C18-C17	-6.30	114.33	123.45
2	A	301	V28	O14-S13-O15	-6.24	109.86	119.59
2	B	301	V28	O35-C30-C31	5.95	117.18	109.18
2	C	301	V28	O20-C18-C17	5.13	120.42	111.92
2	B	301	V28	O20-C18-C17	4.77	119.82	111.92
2	B	301	V28	C32-C31-C30	4.66	117.02	109.58
2	D	301	V28	C34-O35-C30	4.64	121.78	112.54
2	D	301	V28	O35-C30-C31	4.64	115.42	109.18
2	C	301	V28	C32-C31-N40	-4.58	102.17	110.62
2	D	301	V28	C33-C32-C31	4.56	117.04	110.40
2	A	301	V28	O20-C18-C17	4.12	118.74	111.92
2	A	301	V28	N28-N27-N26	-3.79	103.89	107.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	301	V28	O15-S13-C10	3.71	112.72	108.10
2	B	301	V28	O19-C18-C17	-3.71	118.08	123.45
2	B	301	V28	C30-N28-C29	3.68	135.25	128.40
2	C	301	V28	O14-S13-N16	3.62	113.30	106.97
2	B	301	V28	O14-S13-N16	3.43	112.97	106.97
2	B	301	V28	C34-O35-C30	3.20	118.91	112.54
2	B	301	V28	C32-C31-N40	-3.18	104.75	110.62
2	C	301	V28	C30-C31-N40	3.18	115.98	111.10
2	D	301	V28	C11-C10-S13	3.17	122.89	119.73
2	B	301	V28	C30-N28-N27	-3.12	114.92	119.98
2	A	301	V28	C32-C31-C30	3.08	114.50	109.58
2	A	301	V28	O35-C30-C31	2.99	113.20	109.18
2	A	301	V28	O15-S13-N16	2.96	112.15	106.97
2	C	301	V28	C24-C25-N26	2.94	126.95	121.75
2	C	301	V28	C34-O35-C30	2.91	118.33	112.54
2	D	301	V28	C24-C25-C29	-2.90	124.89	129.89
2	B	301	V28	C24-N16-S13	2.89	122.60	117.79
2	A	301	V28	C30-N28-N27	-2.88	115.30	119.98
2	D	301	V28	C24-C25-N26	2.86	126.81	121.75
2	C	301	V28	C11-C10-S13	2.85	122.56	119.73
2	A	301	V28	C09-C10-S13	2.77	122.49	119.73
2	B	301	V28	C24-C25-C29	-2.74	125.17	129.89
2	C	301	V28	O15-S13-N16	2.73	111.74	106.97
2	C	301	V28	C25-C29-N28	2.68	107.75	105.13
2	C	301	V28	C24-C25-C29	-2.65	125.32	129.89
2	A	301	V28	C30-N28-C29	2.63	133.29	128.40
2	C	301	V28	C31-N40-C41	2.60	129.19	123.11
2	A	301	V28	O15-S13-C10	2.59	111.33	108.10
2	C	301	V28	C42-C41-N40	-2.58	111.83	116.12
2	D	301	V28	O14-S13-C10	2.55	111.28	108.10
2	D	301	V28	C32-C31-C30	2.55	113.66	109.58
2	A	301	V28	C24-C25-N26	2.52	126.22	121.75
2	C	301	V28	N28-N27-N26	-2.51	104.97	107.09
2	C	301	V28	C24-N16-S13	2.51	121.97	117.79
2	B	301	V28	C30-C31-N40	-2.51	107.25	111.10
2	A	301	V28	C24-N16-S13	2.48	121.91	117.79
2	C	301	V28	O35-C34-C33	2.48	114.16	109.70
2	B	301	V28	C11-C10-S13	2.43	122.15	119.73
2	C	301	V28	C30-N28-C29	2.39	132.85	128.40
2	C	301	V28	O20-C18-O19	-2.36	118.73	124.08
2	D	301	V28	C25-C29-N28	2.34	107.41	105.13
2	C	301	V28	O35-C30-C31	2.30	112.28	109.18

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	301	V28	N28-N27-N26	-2.29	105.16	107.09
2	C	301	V28	C08-C07-C01	-2.28	117.32	121.25
2	A	301	V28	C25-C29-N28	2.27	107.35	105.13
2	B	301	V28	C09-C10-S13	-2.26	117.49	119.73
2	B	301	V28	C25-C29-N28	2.24	107.32	105.13
2	B	301	V28	C08-C07-C01	-2.15	117.54	121.25
2	A	301	V28	O37-C36-C34	-2.14	104.05	111.33
2	A	301	V28	C17-N16-S13	2.12	122.70	118.39
2	A	301	V28	C21-C17-N16	-2.08	109.29	112.83
2	B	301	V28	C24-C25-N26	2.07	125.42	121.75
2	A	301	V28	C09-C10-C11	-2.06	117.78	120.47
2	D	301	V28	C32-C33-C34	2.03	113.91	110.23
2	C	301	V28	C30-N28-N27	-2.03	116.69	119.98
2	B	301	V28	O15-S13-C10	2.01	110.60	108.10

There are no chirality outliers.

All (19) torsion outliers are listed below:

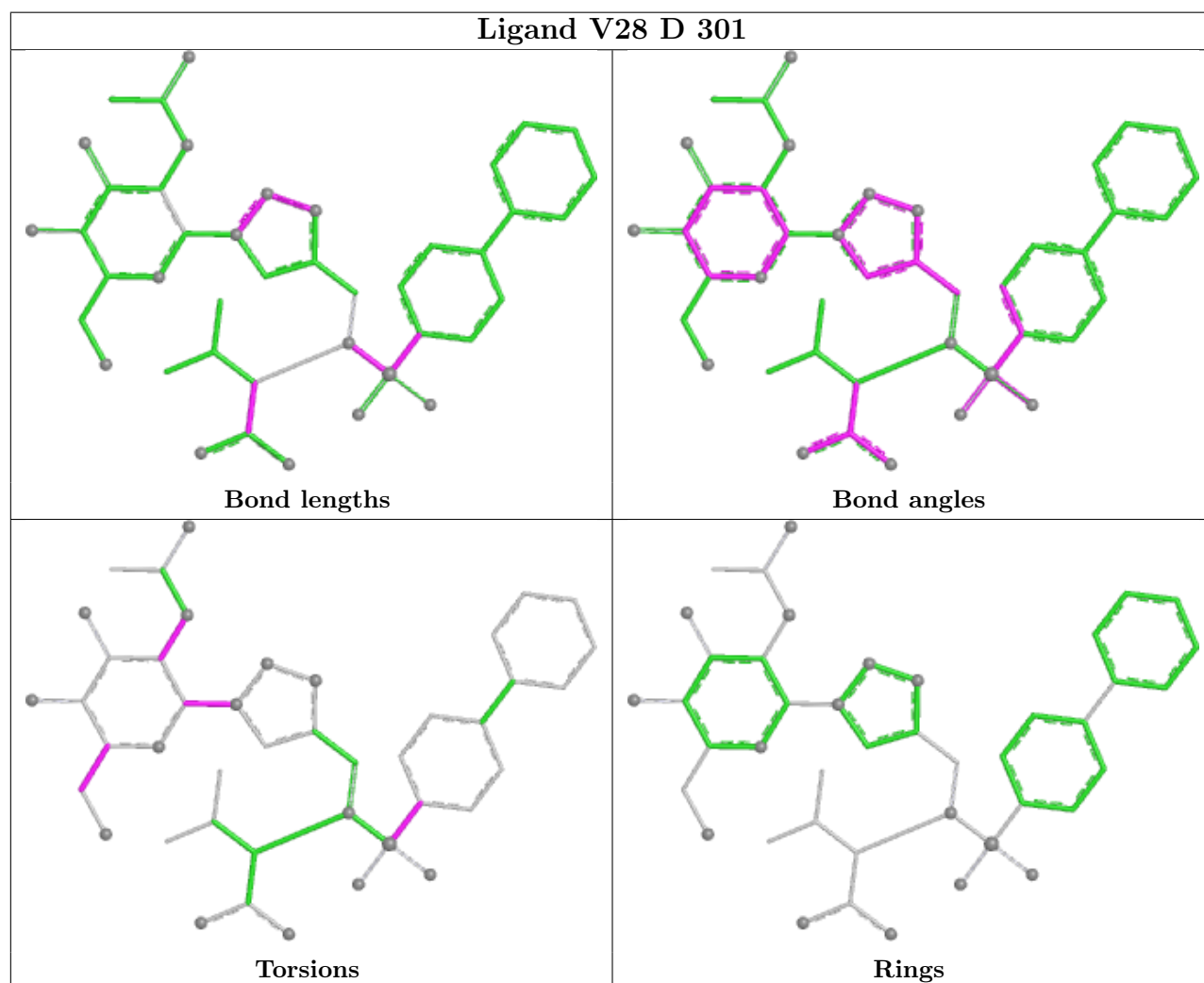
Mol	Chain	Res	Type	Atoms
2	C	301	V28	C42-C41-N40-C31
2	C	301	V28	C32-C31-N40-C41
2	C	301	V28	O35-C34-C36-O37
2	D	301	V28	O35-C34-C36-O37
2	C	301	V28	C33-C34-C36-O37
2	C	301	V28	O43-C41-N40-C31
2	D	301	V28	C31-C30-N28-C29
2	B	301	V28	N16-C17-C18-O19
2	C	301	V28	C30-C31-N40-C41
2	D	301	V28	C32-C31-N40-C41
2	A	301	V28	N16-C17-C18-O19
2	D	301	V28	C09-C10-S13-O15
2	A	301	V28	C33-C34-C36-O37
2	B	301	V28	C32-C31-N40-C41
2	B	301	V28	N16-C17-C18-O20
2	B	301	V28	C30-C31-N40-C41
2	D	301	V28	C30-C31-N40-C41
2	B	301	V28	C31-C30-N28-N27
2	D	301	V28	C11-C10-S13-O15

There are no ring outliers.

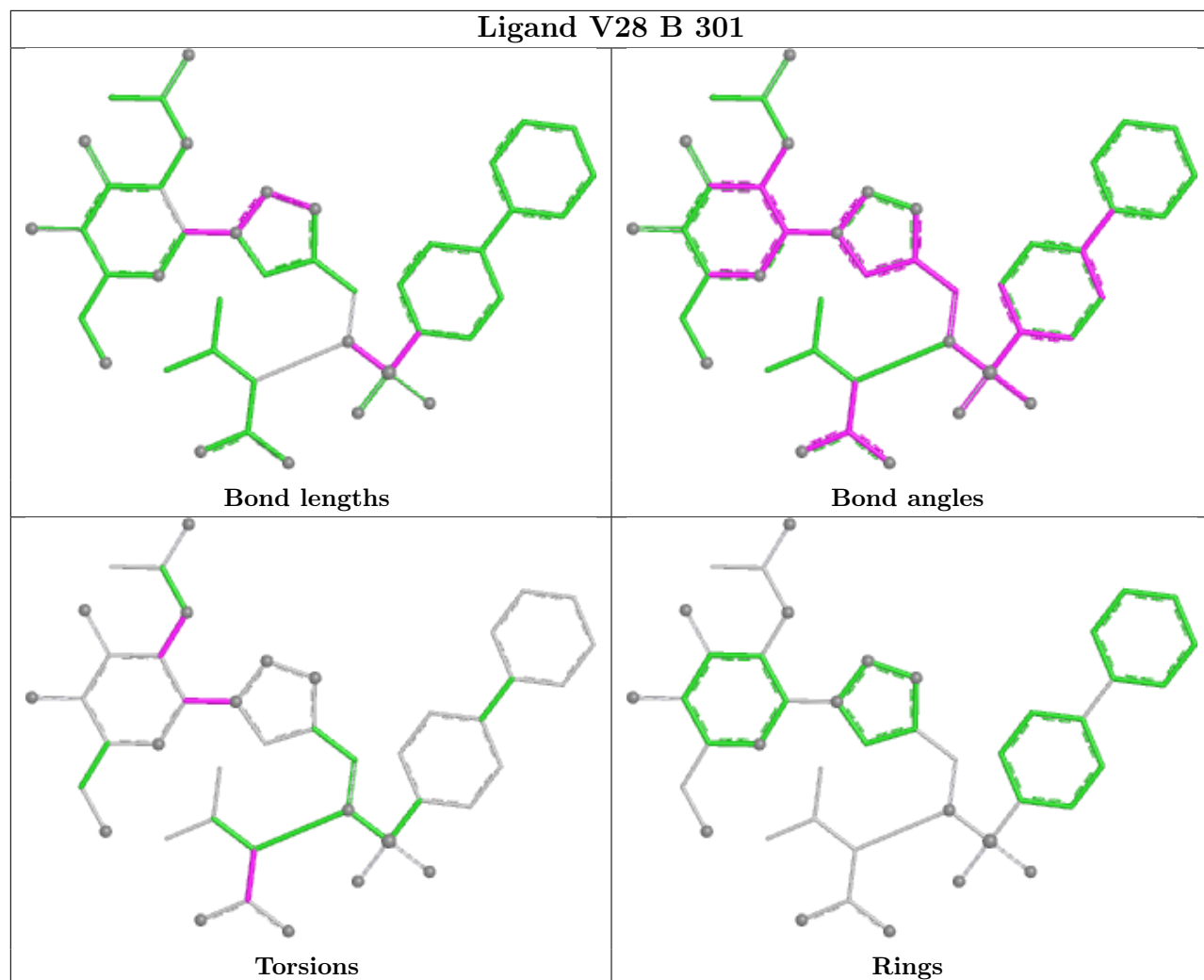
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	301	V28	1	0

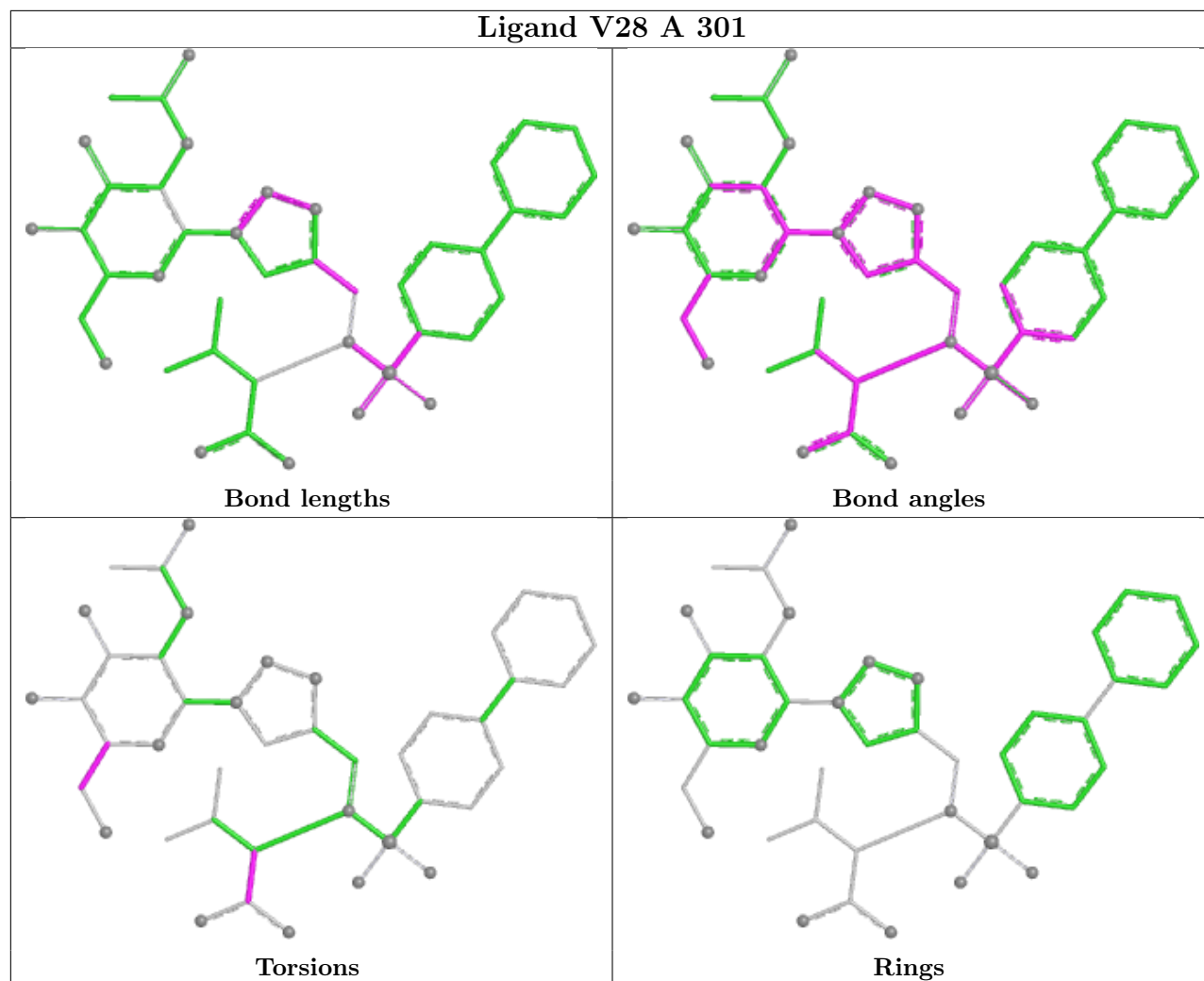
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

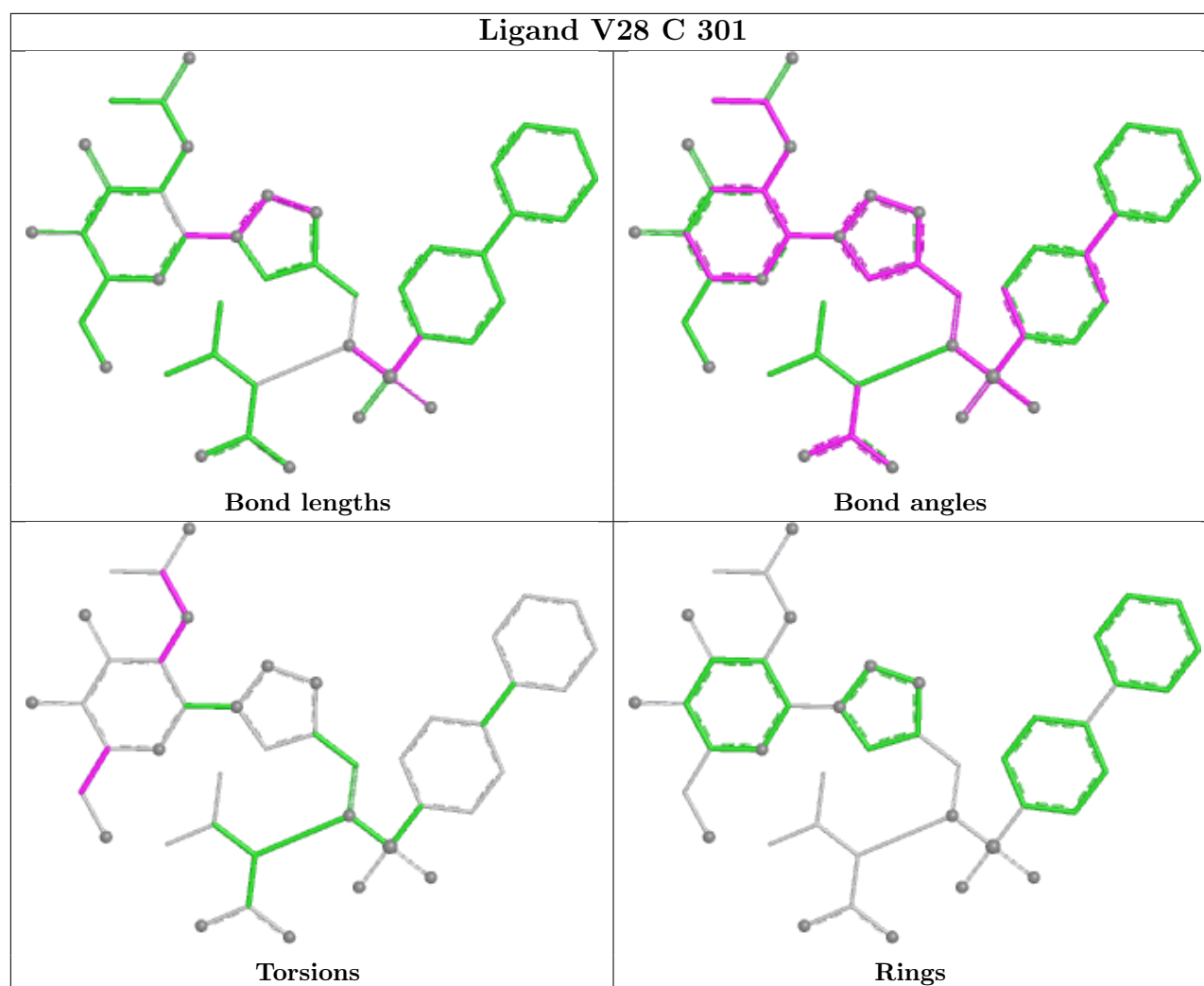


Ligand V28 B 301



Ligand V28 A 301





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	156/159 (98%)	-0.22	3 (1%) 66 68	5, 14, 34, 49	0
1	B	156/159 (98%)	1.21	23 (14%) 6 5	25, 37, 56, 71	0
1	C	156/159 (98%)	-0.19	2 (1%) 75 76	5, 15, 33, 61	1 (0%)
1	D	156/159 (98%)	1.26	22 (14%) 6 5	22, 41, 59, 78	1 (0%)
All	All	624/636 (98%)	0.52	50 (8%) 18 18	5, 30, 54, 78	2 (0%)

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	212	LEU	4.3
1	B	208	GLY	4.0
1	D	241[A]	LYS	3.9
1	B	121	TYR	3.4
1	D	155	GLY	3.3
1	A	263	GLY	3.2
1	C	208	GLY	3.2
1	D	132	TYR	3.2
1	D	263	GLY	3.2
1	B	113	TYR	2.9
1	D	240	TYR	2.9
1	B	110	ARG	2.8
1	B	180	ILE	2.8
1	B	245	ILE	2.8
1	B	206	HIS	2.8
1	D	243	VAL	2.7
1	B	143	ASN	2.6
1	A	208	GLY	2.6
1	B	166	GLY	2.6
1	D	174	PHE	2.5
1	B	140	VAL	2.5

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Mol	Chain	Res	Type	RSRZ
1	D	208	GLY	2.5
1	D	238	PRO	2.5
1	D	112	HIS	2.5
1	D	262	TYR	2.4
1	B	263	GLY	2.4
1	B	132	TYR	2.4
1	D	127	ARG	2.4
1	B	238	PRO	2.4
1	B	108	VAL	2.3
1	C	113	TYR	2.3
1	B	237	PHE	2.3
1	D	205	THR	2.3
1	B	169	GLY	2.3
1	D	162	VAL	2.2
1	B	207	SER	2.2
1	B	174	PHE	2.2
1	D	156	MET	2.2
1	A	113	TYR	2.2
1	B	240	TYR	2.2
1	B	131	ASP	2.1
1	D	202	PHE	2.1
1	D	165	ARG	2.1
1	D	191	ILE	2.1
1	D	248	PHE	2.1
1	B	261	LEU	2.0
1	D	249	ARG	2.0
1	D	172	HIS	2.0
1	D	124	ASP	2.0
1	B	205	THR	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 oligosaccharides in this entry.

6.4 Ligands ⓘ

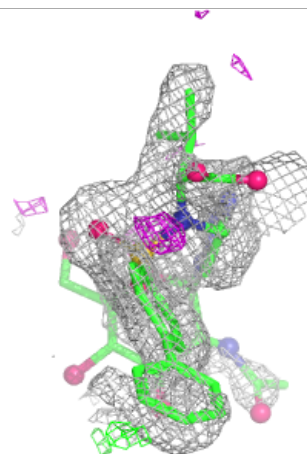
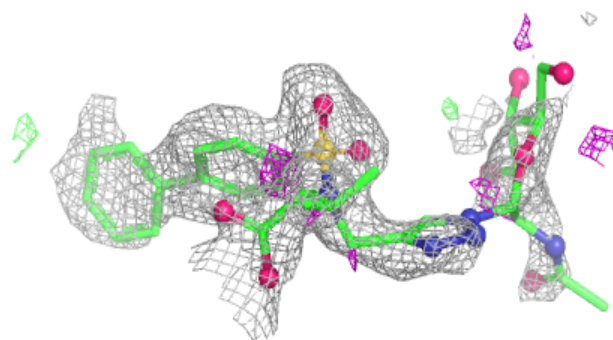
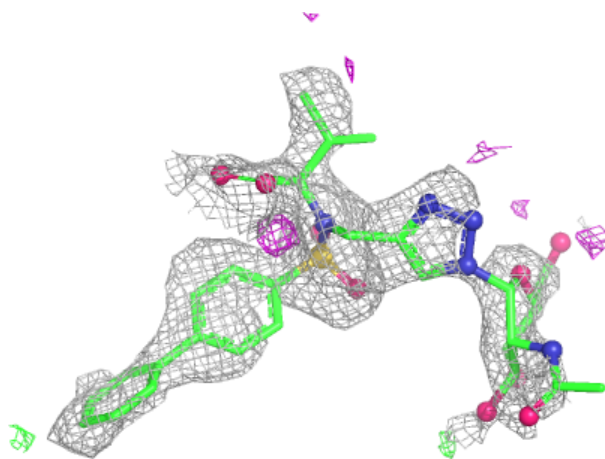
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	V28	B	301	43/43	0.68	0.21	49,70,98,111	0
2	V28	D	301	43/43	0.76	0.18	36,54,72,78	0
2	V28	A	301	43/43	0.91	0.11	10,27,52,54	0
2	V28	C	301	43/43	0.92	0.11	14,27,53,59	0
4	CA	B	304	1/1	0.96	0.04	29,29,29,29	0
4	CA	B	306	1/1	0.96	0.09	34,34,34,34	0
4	CA	D	306	1/1	0.97	0.04	36,36,36,36	0
4	CA	A	306	1/1	0.98	0.02	9,9,9,9	0
4	CA	D	304	1/1	0.98	0.04	37,37,37,37	0
4	CA	D	305	1/1	0.98	0.09	43,43,43,43	0
4	CA	B	305	1/1	0.98	0.06	39,39,39,39	0
4	CA	A	304	1/1	0.99	0.03	13,13,13,13	0
3	ZN	B	303	1/1	0.99	0.02	33,33,33,33	0
3	ZN	D	302	1/1	0.99	0.03	38,38,38,38	0
3	ZN	D	303	1/1	0.99	0.02	35,35,35,35	0
3	ZN	C	303	1/1	1.00	0.01	8,8,8,8	0
3	ZN	A	303	1/1	1.00	0.01	9,9,9,9	0
3	ZN	B	302	1/1	1.00	0.02	38,38,38,38	0
4	CA	C	304	1/1	1.00	0.01	13,13,13,13	0
4	CA	C	305	1/1	1.00	0.01	11,11,11,11	0
4	CA	C	306	1/1	1.00	0.05	8,8,8,8	0
3	ZN	A	302	1/1	1.00	0.01	12,12,12,12	0
4	CA	A	305	1/1	1.00	0.03	10,10,10,10	0
3	ZN	C	302	1/1	1.00	0.01	13,13,13,13	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.

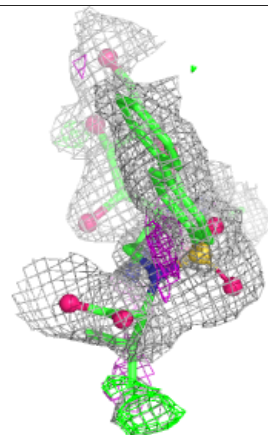
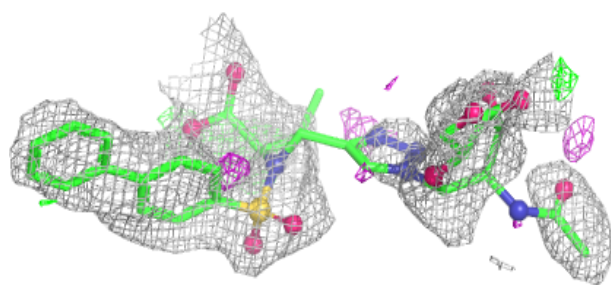
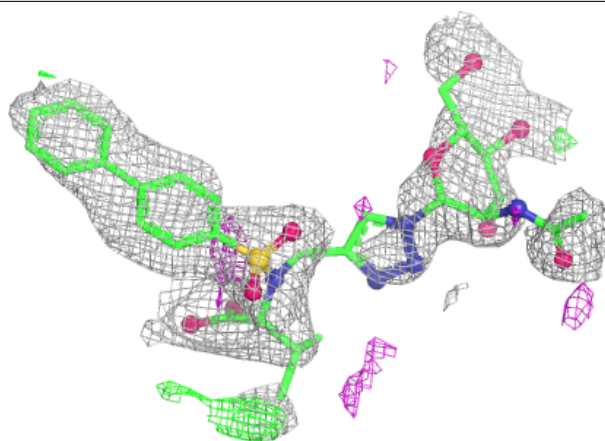
Electron density around V28 B 301:

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



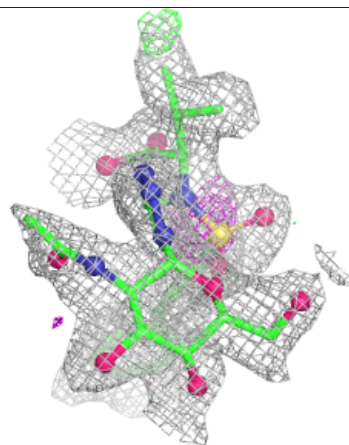
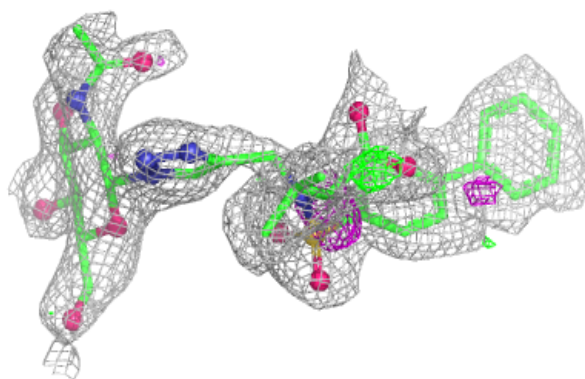
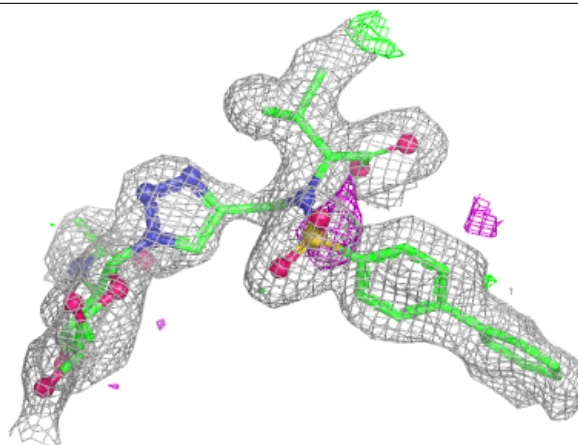
Electron density around V28 D 301:

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



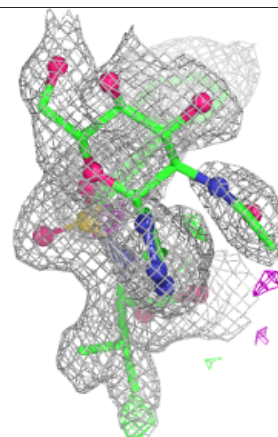
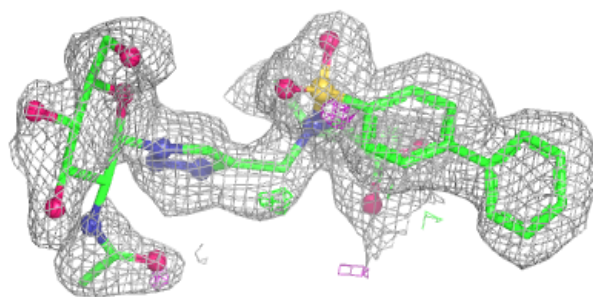
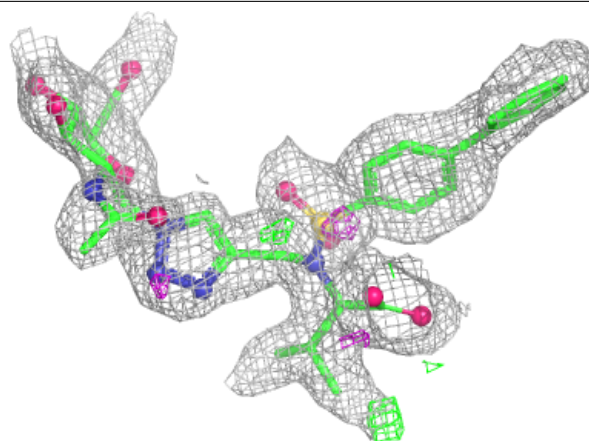
Electron density around V28 A 301:

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



Electron density around V28 C 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.