



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:22 PM UTC

PDB ID : 3IXK / pdb_00003ixk
Title : Potent beta-secretase 1 inhibitor
Authors : Borkakoti, N.; Lindberg, J.D.; Nystrom, S.
Deposited on : 2009-09-04
Resolution : 2.50 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

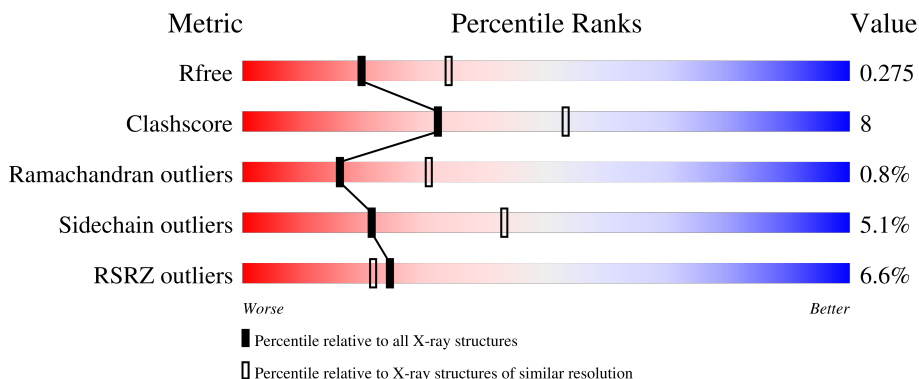
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	405	6% 73% 17% • 8%
1	B	405	5% 73% 16% • 8%
1	C	405	7% 68% 19% • 8%

2 Entry composition [i](#)

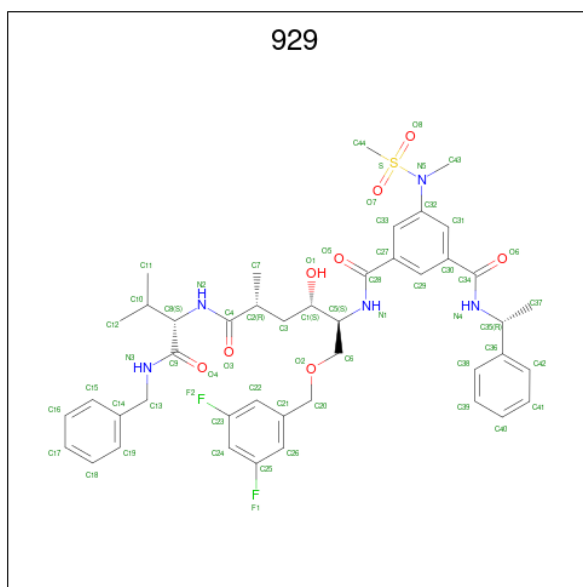
There are 3 unique types of molecules in this entry. The entry contains 9056 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Beta-secretase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	373	Total	C	N	O	S	0	0	0
			2940	1882	489	555	14			
1	B	373	Total	C	N	O	S	0	0	0
			2940	1882	489	555	14			
1	C	371	Total	C	N	O	S	0	0	0
			2925	1874	486	551	14			

- Molecule 2 is N-[(2S,3S,5R)-1-[(3,5-difluorophenyl)methoxy]-3-hydroxy-5-methyl-6-[(2S)-3-methyl-1-oxo-1-(phenylmethylamino)butan-2-yl]amino]-6-oxo-hexan-2-yl]-5-(methylmethylsulfonyl-amino)-N'-[(1R)-1-phenylethyl]benzene-1,3-dicarboxamide (CCD ID: 929) (formula: C₄₄H₅₃F₂N₅O₈S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	S	0
			60	44	2	5	8	1	
2	B	1	Total	C	F	N	O	S	0
			60	44	2	5	8	1	

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Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	C	1	Total	C	F	N	O	S	0	0
			60	44	2	5	8	1		

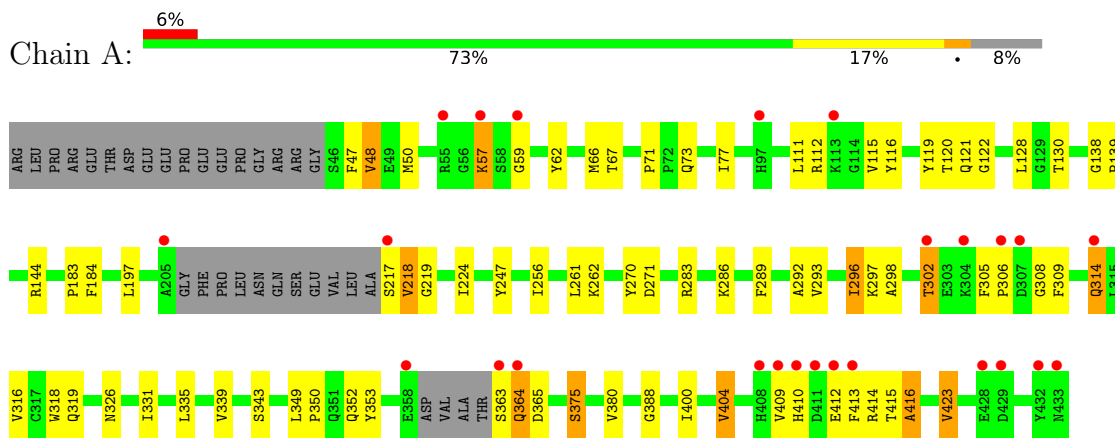
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	18	Total	O	0	0
			18	18		
3	B	25	Total	O	0	0
			25	25		
3	C	28	Total	O	0	0
			28	28		

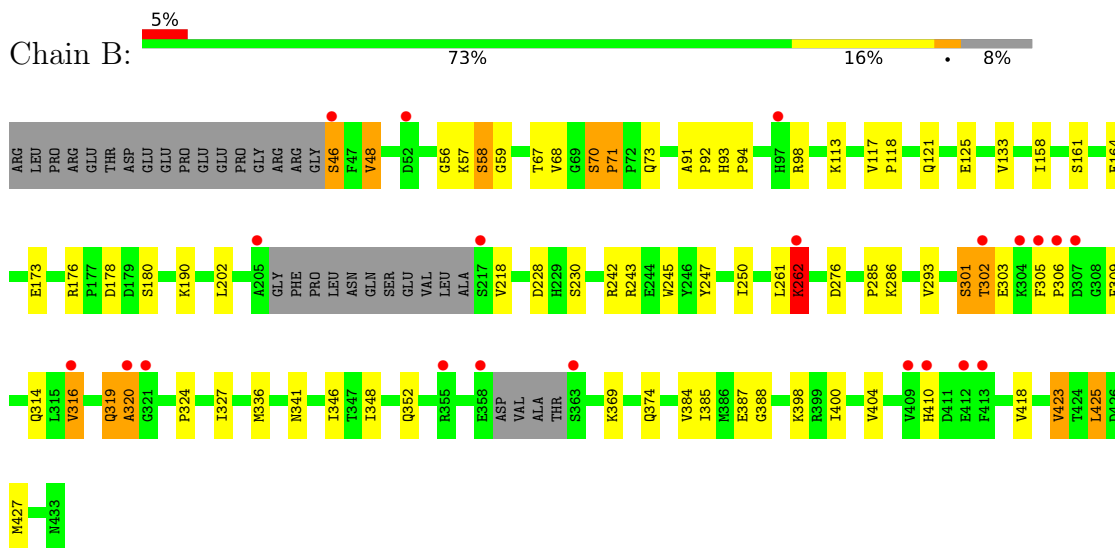
3 Residue-property plots

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

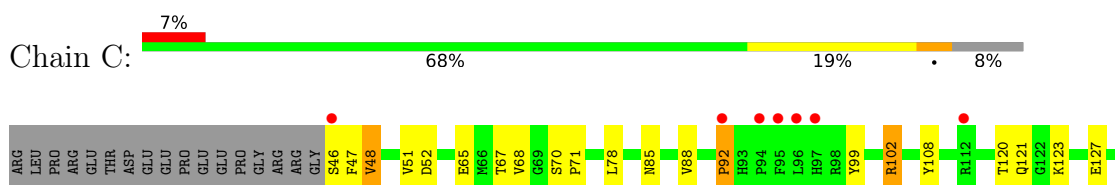
• Molecule 1: Beta-secretase 1

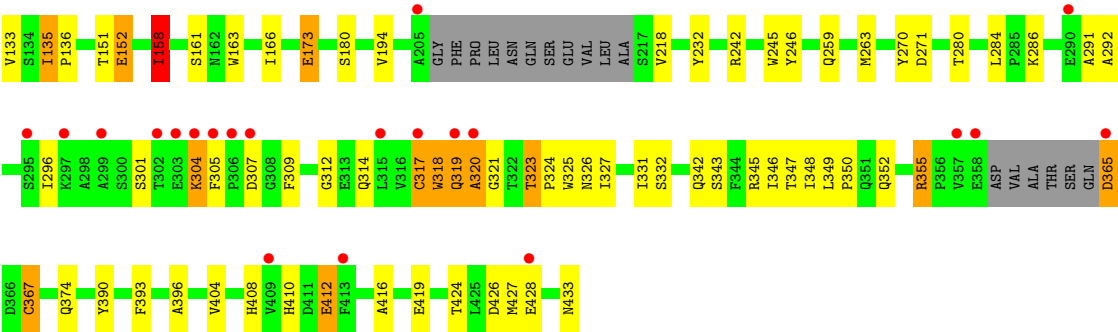


• Molecule 1: Beta-secretase 1



• Molecule 1: Beta-secretase 1





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	81.84Å 103.08Å 100.50Å 90.00° 103.32° 90.00°	Depositor
Resolution (Å)	40.26 – 2.50 40.26 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.7 (40.26-2.50) 99.7 (40.26-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.67 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.229 , 0.282 0.224 , 0.275	Depositor DCC
R_{free} test set	2849 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	40.1	Xtriage
Anisotropy	0.062	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 33.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	9056	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% 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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 929

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	0.96	3/3014 (0.1%)	1.28	9/4092 (0.2%)
1	B	0.91	2/3014 (0.1%)	1.27	6/4092 (0.1%)
1	C	0.90	1/2999 (0.0%)	1.28	25/4072 (0.6%)
All	All	0.93	6/9027 (0.1%)	1.28	40/12256 (0.3%)

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
1	B	0	1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	339	VAL	CA-CB	6.43	1.65	1.54
1	A	219	GLY	N-CA	5.49	1.50	1.45
1	B	113	LYS	CD-CE	5.33	1.68	1.52
1	A	404	VAL	CA-CB	5.25	1.60	1.54
1	B	113	LYS	CE-NZ	5.09	1.64	1.49
1	C	291	ALA	CA-CB	-5.00	1.45	1.53

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	423	VAL	CB-CA-C	-11.04	96.09	111.21
1	C	48	VAL	CB-CA-C	-9.44	99.68	112.04
1	C	47	PHE	N-CA-C	9.11	121.29	111.36
1	B	71	PRO	CA-C-N	8.61	130.61	119.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	71	PRO	C-N-CA	8.61	130.61	119.84
1	B	388	GLY	N-CA-C	7.39	122.60	114.40
1	A	416	ALA	N-CA-C	-6.84	100.16	110.28
1	C	194	VAL	CA-C-N	-6.60	113.50	120.03
1	C	194	VAL	C-N-CA	-6.60	113.50	120.03
1	B	48	VAL	CB-CA-C	-6.55	103.30	112.14
1	C	121	GLN	N-CA-C	6.52	123.19	114.12
1	C	85	ASN	N-CA-C	6.50	120.25	109.46
1	C	121	GLN	CA-C-N	-6.27	115.77	122.67
1	C	121	GLN	C-N-CA	-6.27	115.77	122.67
1	C	396	ALA	N-CA-C	-6.21	104.61	111.82
1	A	388	GLY	N-CA-C	6.11	121.81	113.99
1	C	180	SER	N-CA-C	-6.07	106.21	113.97
1	A	47	PHE	N-CA-C	6.01	117.91	111.36
1	C	48	VAL	N-CA-CB	5.98	117.94	110.47
1	C	135	ILE	N-CA-C	5.95	114.05	108.15
1	A	326	ASN	N-CA-C	5.82	119.91	112.34
1	B	410	HIS	N-CA-C	5.63	117.74	110.65
1	C	318	TRP	CA-C-N	-5.58	113.20	121.24
1	C	318	TRP	C-N-CA	-5.58	113.20	121.24
1	C	301	SER	N-CA-C	5.58	118.29	111.82
1	C	367	CYS	N-CA-C	5.56	118.62	109.72
1	C	284	LEU	CA-C-N	-5.50	114.11	119.78
1	C	284	LEU	C-N-CA	-5.50	114.11	119.78
1	C	426	ASP	N-CA-C	5.42	118.87	111.39
1	A	298	ALA	N-CA-C	5.34	117.85	111.71
1	C	120	THR	CA-C-N	-5.31	113.89	122.23
1	C	120	THR	C-N-CA	-5.31	113.89	122.23
1	A	71	PRO	CA-C-N	5.26	125.56	119.93
1	A	71	PRO	C-N-CA	5.26	125.56	119.93
1	A	296	ILE	N-CA-C	-5.18	104.61	111.09
1	C	102	ARG	N-CA-C	5.14	117.55	111.33
1	C	158	ILE	N-CA-C	-5.10	101.06	108.97
1	B	352	GLN	N-CA-C	-5.07	107.23	113.41
1	C	218	VAL	N-CA-C	5.05	117.03	109.20
1	C	309	PHE	N-CA-C	-5.03	105.51	111.69

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	245	TRP	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	2940	0	2849	40	0
1	B	2940	0	2849	46	0
1	C	2925	0	2838	55	0
2	A	60	0	53	4	0
2	B	60	0	53	4	0
2	C	60	0	53	0	0
3	A	18	0	0	1	0
3	B	25	0	0	1	0
3	C	28	0	0	5	0
All	All	9056	0	8695	141	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 8.

All (141) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:355:ARG:HD2	3:C:524:HOH:O	1.51	1.09
1:B:46:SER:HB3	3:B:515:HOH:O	1.72	0.89
1:C:317:CYS:HG	1:C:367:CYS:HG	1.23	0.85
1:A:256:ILE:HD12	1:A:261:LEU:HD13	1.58	0.83
1:C:342:GLN:C	1:C:427:MET:HE1	2.04	0.82
1:C:292:ALA:O	1:C:296:ILE:HG13	1.81	0.79
1:B:261:LEU:O	1:B:262:LYS:HB2	1.82	0.77
1:B:319:GLN:CD	1:B:319:GLN:H	1.94	0.76
1:C:304:LYS:HE2	1:C:305:PHE:H	1.49	0.75
1:C:424:THR:HB	1:C:427:MET:CE	2.18	0.73
1:B:319:GLN:H	1:B:319:GLN:NE2	1.86	0.71
1:B:302:THR:O	1:B:303:GLU:HG2	1.93	0.69
1:A:48:VAL:CG1	1:B:125:GLU:HB2	2.22	0.69
1:C:365:ASP:OD1	1:C:365:ASP:N	2.27	0.68
1:B:261:LEU:O	1:B:262:LYS:CB	2.40	0.67
1:A:50:MET:HG2	1:A:138:GLY:HA2	1.78	0.66
1:B:250:ILE:HG21	1:B:336:MET:CE	2.26	0.66
1:C:318:TRP:CE3	1:C:323:THR:HG23	2.30	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:349:LEU:HB3	1:C:350:PRO:HD2	1.79	0.64
1:A:292:ALA:O	1:A:296:ILE:HG13	1.98	0.64
1:C:424:THR:HB	1:C:427:MET:HE2	1.78	0.64
1:C:343:SER:HB3	1:C:427:MET:HE2	1.80	0.64
1:B:242:ARG:HD2	1:B:250:ILE:HD11	1.81	0.62
1:B:319:GLN:CD	1:B:319:GLN:N	2.57	0.62
1:A:350:PRO:HA	1:A:353:TYR:CE2	2.34	0.61
1:B:336:MET:HE1	1:B:427:MET:HA	1.81	0.60
1:B:306:PRO:HB2	1:B:314:GLN:NE2	2.16	0.60
1:C:342:GLN:O	1:C:427:MET:HE1	2.02	0.59
1:B:250:ILE:HG21	1:B:336:MET:HE3	1.85	0.59
1:A:305:PHE:HD1	1:A:316:VAL:HG11	1.68	0.59
1:C:319:GLN:O	1:C:320:ALA:C	2.45	0.58
1:C:428:GLU:HA	1:C:428:GLU:OE1	2.03	0.57
1:B:286:LYS:HG3	1:B:374:GLN:OE1	2.04	0.57
1:C:424:THR:HB	1:C:427:MET:HE3	1.86	0.56
1:C:408:HIS:CE1	1:C:416:ALA:H	2.23	0.56
1:A:256:ILE:HD12	1:A:261:LEU:CD1	2.34	0.55
1:A:308:GLY:HA3	1:A:314:GLN:HE21	1.71	0.55
1:B:250:ILE:CG2	1:B:336:MET:HE3	2.36	0.54
1:C:78:LEU:HD23	1:C:166:ILE:HD12	1.90	0.54
1:A:283:ARG:CZ	1:A:375:SER:HB2	2.37	0.54
1:C:127:GLU:OE2	1:C:151:THR:HG21	2.08	0.54
1:C:173:GLU:O	1:C:173:GLU:HG3	2.07	0.53
1:A:349:LEU:H	1:A:352:GLN:NE2	2.07	0.53
1:A:365:ASP:HB2	3:A:513:HOH:O	2.09	0.53
1:B:68:VAL:HG12	1:B:133:VAL:HG22	1.90	0.53
1:C:404:VAL:HG21	3:C:523:HOH:O	2.07	0.53
1:A:115:VAL:HG22	1:A:116:TYR:N	2.24	0.53
1:B:305:PHE:HD1	1:B:316:VAL:HG11	1.74	0.52
1:C:158:ILE:HB	1:C:161:SER:HB3	1.90	0.52
1:C:161:SER:HG	1:C:163:TRP:CD1	2.27	0.52
1:B:67:THR:HA	1:B:73:GLN:O	2.10	0.52
1:A:289:PHE:O	1:A:293:VAL:HG23	2.10	0.51
1:A:415:THR:HG22	1:A:416:ALA:O	2.11	0.51
1:C:151:THR:O	1:C:152:GLU:HG3	2.10	0.51
1:A:130:THR:OG1	1:A:144:ARG:NH1	2.43	0.51
1:A:62:TYR:CE2	1:A:218:VAL:HG13	2.46	0.50
1:C:304:LYS:HE2	1:C:305:PHE:N	2.23	0.50
1:B:93:HIS:CG	1:B:94:PRO:HD2	2.47	0.50
1:B:319:GLN:O	1:B:320:ALA:C	2.54	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:343:SER:HB3	1:C:427:MET:CE	2.39	0.50
1:C:242:ARG:NH2	1:C:433:ASN:HD21	2.10	0.49
1:C:345:ARG:NH2	1:C:419:GLU:OE1	2.37	0.49
1:C:324:PRO:HB2	1:C:327:ILE:HG12	1.95	0.49
1:B:173:GLU:OE2	1:B:243:ARG:NH2	2.36	0.49
1:C:286:LYS:HG3	1:C:374:GLN:OE1	2.13	0.49
1:B:276:ASP:OD2	2:B:500:929:O1	2.30	0.48
1:B:56:GLY:C	1:B:218:VAL:HG22	2.37	0.48
1:A:306:PRO:O	1:A:309:PHE:HB3	2.14	0.48
1:A:270:TYR:HA	1:A:271:ASP:HA	1.64	0.48
1:C:51:VAL:O	1:C:52:ASP:CB	2.62	0.48
1:A:293:VAL:O	1:A:297:LYS:HB2	2.14	0.48
1:A:308:GLY:CA	1:A:314:GLN:HE21	2.26	0.47
1:C:331:ILE:O	1:C:347:THR:HA	2.14	0.47
1:B:336:MET:HE1	1:B:427:MET:CA	2.45	0.47
1:A:48:VAL:HG11	1:B:125:GLU:HB2	1.94	0.47
1:C:245:TRP:CG	1:C:246:TYR:H	2.32	0.47
1:B:57:LYS:O	1:B:58:SER:C	2.56	0.47
1:C:102:ARG:HD2	1:C:108:TYR:CZ	2.50	0.47
1:C:404:VAL:HB	3:C:522:HOH:O	2.14	0.47
1:A:119:TYR:HB3	2:A:500:929:H5	1.96	0.47
1:A:283:ARG:HB2	1:A:380:VAL:HB	1.97	0.47
1:A:413:PHE:CE2	1:A:414:ARG:HG3	2.51	0.46
1:A:119:TYR:O	1:A:120:THR:C	2.56	0.46
1:B:346:ILE:HG22	1:B:418:VAL:HG22	1.97	0.46
1:A:247:TYR:HB3	1:A:400:ILE:HD11	1.98	0.46
1:B:70:SER:HA	1:B:71:PRO:C	2.40	0.46
1:B:301:SER:C	1:B:303:GLU:H	2.23	0.46
1:C:412:GLU:H	1:C:412:GLU:CD	2.24	0.46
1:B:117:VAL:HG22	1:B:176:ARG:HB2	1.98	0.46
1:C:319:GLN:O	1:C:321:GLY:N	2.49	0.46
1:C:319:GLN:HE21	1:C:319:GLN:HB2	1.62	0.46
1:A:197:LEU:HD23	1:A:197:LEU:C	2.41	0.46
1:C:232:TYR:CD1	1:C:390:TYR:CD2	3.03	0.46
1:A:59:GLY:O	2:A:500:929:H38	2.16	0.45
1:B:91:ALA:HB1	1:B:92:PRO:HD2	1.97	0.45
1:A:66:MET:SD	1:A:77:ILE:HG13	2.56	0.45
1:A:67:THR:HA	1:A:73:GLN:O	2.17	0.45
1:B:348:ILE:HG21	1:B:385:ILE:HD13	1.99	0.45
1:C:65:GLU:HG2	1:C:136:PRO:HG2	1.97	0.45
1:A:122:GLY:N	2:A:500:929:F2	2.40	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:500:929:O3	2:A:500:929:C9	2.59	0.45
1:B:202:LEU:O	1:B:387:GLU:HA	2.17	0.45
1:C:324:PRO:O	1:C:325:TRP:C	2.59	0.44
1:A:57:LYS:N	1:A:57:LYS:HE2	2.32	0.44
1:C:88:VAL:O	1:C:88:VAL:HG23	2.17	0.44
1:C:46:SER:HA	3:C:514:HOH:O	2.18	0.44
1:C:332:SER:HA	1:C:346:ILE:O	2.18	0.44
1:C:270:TYR:HA	1:C:271:ASP:HA	1.73	0.44
1:B:228:ASP:OD1	1:B:230:SER:HB3	2.18	0.44
1:B:98:ARG:O	1:B:164:GLU:HG2	2.18	0.43
1:C:92:PRO:HD3	1:C:99:TYR:CZ	2.53	0.43
1:C:393:PHE:N	1:C:393:PHE:CD1	2.86	0.43
1:B:306:PRO:O	1:B:309:PHE:HB3	2.18	0.43
1:B:285:PRO:O	1:B:286:LYS:C	2.62	0.43
1:C:68:VAL:HG12	1:C:133:VAL:HG22	2.01	0.43
1:B:324:PRO:HB2	1:B:327:ILE:HG12	2.01	0.43
1:B:158:ILE:HB	1:B:161:SER:HB3	2.00	0.42
1:B:301:SER:C	1:B:303:GLU:N	2.76	0.42
1:C:70:SER:HA	1:C:71:PRO:C	2.44	0.42
1:A:305:PHE:CD1	1:A:316:VAL:HG11	2.51	0.42
1:A:318:TRP:O	1:A:319:GLN:C	2.62	0.42
1:C:67:THR:O	1:C:133:VAL:HA	2.20	0.42
1:A:121:GLN:O	1:A:121:GLN:HG3	2.20	0.41
1:A:111:LEU:HD12	1:A:128:LEU:HB3	2.02	0.41
1:B:398:LYS:HB2	1:B:398:LYS:HE3	1.85	0.41
1:B:247:TYR:HB3	1:B:400:ILE:HD11	2.01	0.41
1:C:349:LEU:H	1:C:352:GLN:NE2	2.18	0.41
1:C:408:HIS:CE1	1:C:410:HIS:HB3	2.54	0.41
1:A:139:PRO:HD3	1:A:224:ILE:HD12	2.02	0.41
1:A:335:LEU:O	1:A:343:SER:HB2	2.20	0.41
1:B:178:ASP:OD1	1:B:180:SER:OG	2.31	0.41
1:B:118:PRO:HB2	2:B:500:929:H19	2.01	0.41
1:C:263:MET:HE2	1:C:263:MET:HB3	1.89	0.41
1:A:183:PRO:O	1:A:184:PHE:C	2.64	0.41
1:C:135:ILE:O	1:C:136:PRO:C	2.64	0.41
1:B:59:GLY:HA2	2:B:500:929:H39	2.02	0.41
2:B:500:929:H5	2:B:500:929:H20	1.64	0.41
1:A:364:GLN:HE21	1:A:364:GLN:HB2	1.71	0.41
1:C:312:GLY:HA2	3:C:502:HOH:O	2.21	0.41
1:B:341:ASN:HA	1:B:423:VAL:HA	2.02	0.40
1:C:348:ILE:O	1:C:348:ILE:HG13	2.21	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	367/405 (91%)	355 (97%)	10 (3%)	2 (0%)	24	43
1	B	367/405 (91%)	352 (96%)	11 (3%)	4 (1%)	11	22
1	C	365/405 (90%)	340 (93%)	22 (6%)	3 (1%)	16	31
All	All	1099/1215 (90%)	1047 (95%)	43 (4%)	9 (1%)	16	31

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	320	ALA
1	B	302	THR
1	B	320	ALA
1	C	173	GLU
1	A	286	LYS
1	A	302	THR
1	B	425	LEU
1	B	262	LYS
1	C	92	PRO

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	319/346 (92%)	302 (95%)	17 (5%)	20	42

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	319/346 (92%)	303 (95%)	16 (5%)	22	44
1	C	317/346 (92%)	301 (95%)	16 (5%)	22	44
All	All	955/1038 (92%)	906 (95%)	49 (5%)	21	43

All (49) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	VAL
1	A	57	LYS
1	A	112	ARG
1	A	217	SER
1	A	218	VAL
1	A	262	LYS
1	A	302	THR
1	A	314	GLN
1	A	331	ILE
1	A	363	SER
1	A	364	GLN
1	A	375	SER
1	A	404	VAL
1	A	409	VAL
1	A	410	HIS
1	A	412	GLU
1	A	423	VAL
1	B	46	SER
1	B	48	VAL
1	B	58	SER
1	B	70	SER
1	B	121	GLN
1	B	190	LYS
1	B	262	LYS
1	B	293	VAL
1	B	301	SER
1	B	316	VAL
1	B	319	GLN
1	B	369	LYS
1	B	384	VAL
1	B	404	VAL
1	B	423	VAL
1	B	425	LEU
1	C	48	VAL

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Mol	Chain	Res	Type
1	C	123	LYS
1	C	152	GLU
1	C	158	ILE
1	C	259	GLN
1	C	280	THR
1	C	304	LYS
1	C	307	ASP
1	C	314	GLN
1	C	317	CYS
1	C	319	GLN
1	C	323	THR
1	C	326	ASN
1	C	355	ARG
1	C	365	ASP
1	C	412	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	76	ASN
1	A	314	GLN
1	A	341	ASN
1	A	352	GLN
1	A	364	GLN
1	A	374	GLN
1	B	76	ASN
1	B	159	ASN
1	B	162	ASN
1	B	281	ASN
1	B	314	GLN
1	B	364	GLN
1	B	374	GLN
1	C	76	ASN
1	C	137	HIS
1	C	259	GLN
1	C	281	ASN
1	C	319	GLN
1	C	326	ASN
1	C	341	ASN
1	C	352	GLN
1	C	408	HIS
1	C	410	HIS

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Mol	Chain	Res	Type
1	C	433	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

3 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	929	B	500	-	62,63,63	1.02	2 (3%)	83,88,88	1.53	14 (16%)
2	929	A	500	-	62,63,63	1.11	3 (4%)	83,88,88	2.06	24 (28%)
2	929	C	500	-	62,63,63	1.06	2 (3%)	83,88,88	1.61	16 (19%)

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	929	B	500	-	-	11/65/65/65	0/4/4/4

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	929	A	500	-	-	12/65/65/65	0/4/4/4
2	929	C	500	-	-	10/65/65/65	0/4/4/4

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	500	929	S-N5	-5.02	1.55	1.64
2	A	500	929	S-N5	-4.96	1.55	1.64
2	B	500	929	S-N5	-4.46	1.56	1.64
2	B	500	929	C44-S	-3.81	1.67	1.75
2	C	500	929	C44-S	-3.46	1.68	1.75
2	A	500	929	O8-S	3.43	1.48	1.43
2	A	500	929	C44-S	-2.91	1.69	1.75

All (54) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	500	929	C2-C4-N2	6.62	123.51	116.42
2	C	500	929	C1-C5-N1	5.65	120.56	109.97
2	B	500	929	C20-O2-C6	-4.70	102.12	112.66
2	B	500	929	C2-C4-N2	4.58	121.33	116.42
2	A	500	929	C29-C30-C31	4.52	124.94	119.65
2	A	500	929	O8-S-N5	-4.40	102.11	107.14
2	A	500	929	O1-C1-C3	4.21	117.58	109.15
2	C	500	929	C29-C30-C31	4.18	124.55	119.65
2	A	500	929	C22-C23-C24	-3.97	118.67	123.50
2	A	500	929	F1-C25-C26	3.86	123.77	118.28
2	A	500	929	O7-S-N5	3.85	111.55	107.14
2	B	500	929	O3-C4-C2	-3.80	114.53	121.51
2	C	500	929	C27-C33-C32	3.64	123.72	119.61
2	A	500	929	C30-C31-C32	-3.59	115.55	119.61
2	A	500	929	C7-C2-C3	-3.54	104.54	111.52
2	A	500	929	C8-C9-N3	3.54	122.20	116.38
2	A	500	929	C27-C33-C32	3.37	123.42	119.61
2	C	500	929	C11-C10-C12	3.30	119.66	110.58
2	A	500	929	C23-C24-C25	3.21	120.76	116.08
2	C	500	929	O1-C1-C3	3.18	115.51	109.15
2	B	500	929	O4-C9-C8	-3.10	114.45	120.75
2	B	500	929	C1-C5-N1	3.05	115.69	109.97
2	C	500	929	C24-C25-C26	-2.72	120.19	123.50
2	C	500	929	F1-C25-C26	2.71	122.13	118.28
2	A	500	929	F2-C23-C22	2.70	122.11	118.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	500	929	O6-C34-N4	2.70	127.59	122.47
2	A	500	929	C29-C27-C33	-2.62	116.58	119.65
2	A	500	929	C14-C13-N3	-2.62	107.56	113.07
2	C	500	929	C21-C26-C25	2.58	121.00	118.75
2	C	500	929	O6-C34-C30	-2.58	115.79	120.90
2	B	500	929	C43-N5-S	2.57	121.92	118.23
2	C	500	929	C40-C39-C38	-2.38	117.30	120.24
2	A	500	929	O2-C6-C5	-2.37	103.82	108.72
2	B	500	929	C11-C10-C8	2.35	117.61	111.16
2	A	500	929	O3-C4-N2	-2.33	118.79	122.96
2	A	500	929	F1-C25-C24	-2.32	114.98	118.28
2	C	500	929	C2-C4-N2	2.29	118.88	116.42
2	A	500	929	C21-C22-C23	2.28	120.74	118.75
2	B	500	929	C10-C8-N2	2.27	116.93	111.44
2	A	500	929	C40-C39-C38	-2.22	117.50	120.24
2	B	500	929	C6-C5-N1	2.19	112.78	109.66
2	B	500	929	C35-N4-C34	2.19	126.64	122.39
2	B	500	929	O8-S-C44	-2.19	105.30	108.30
2	C	500	929	O7-S-N5	2.17	109.63	107.14
2	B	500	929	C12-C10-C8	2.15	117.07	111.16
2	C	500	929	C29-C27-C33	-2.15	117.13	119.65
2	A	500	929	O8-S-C44	-2.12	105.39	108.30
2	A	500	929	O4-C9-C8	-2.10	116.49	120.75
2	A	500	929	O3-C4-C2	-2.09	117.67	121.51
2	A	500	929	C27-C28-N1	2.07	120.89	117.04
2	B	500	929	C10-C8-C9	-2.07	106.34	111.38
2	B	500	929	C20-C21-C22	-2.04	115.50	120.30
2	C	500	929	C39-C38-C36	2.02	123.07	120.65
2	C	500	929	C10-C8-C9	-2.01	106.48	111.38

There are no chirality outliers.

All (33) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	500	929	C31-C32-N5-S
2	A	500	929	C33-C32-N5-S
2	A	500	929	N1-C5-C6-O2
2	A	500	929	C1-C5-C6-O2
2	A	500	929	C7-C2-C3-C1
2	A	500	929	C4-C2-C3-C1
2	B	500	929	C31-C32-N5-S
2	B	500	929	C33-C32-N5-S

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Mol	Chain	Res	Type	Atoms
2	B	500	929	N1-C5-C6-O2
2	B	500	929	C7-C2-C3-C1
2	B	500	929	C4-C2-C3-C1
2	C	500	929	C31-C32-N5-S
2	C	500	929	C33-C32-N5-S
2	C	500	929	N1-C5-C6-O2
2	C	500	929	C4-C2-C3-C1
2	C	500	929	C12-C10-C8-C9
2	A	500	929	C12-C10-C8-N2
2	C	500	929	C12-C10-C8-N2
2	B	500	929	C12-C10-C8-N2
2	A	500	929	C11-C10-C8-N2
2	A	500	929	C12-C10-C8-C9
2	B	500	929	C12-C10-C8-C9
2	A	500	929	C11-C10-C8-C9
2	B	500	929	C11-C10-C8-N2
2	C	500	929	C11-C10-C8-N2
2	C	500	929	C11-C10-C8-C9
2	B	500	929	C11-C10-C8-C9
2	A	500	929	C21-C20-O2-C6
2	A	500	929	C5-C6-O2-C20
2	B	500	929	C5-C6-O2-C20
2	C	500	929	C7-C2-C3-C1
2	B	500	929	C33-C27-C28-N1
2	C	500	929	C33-C27-C28-N1

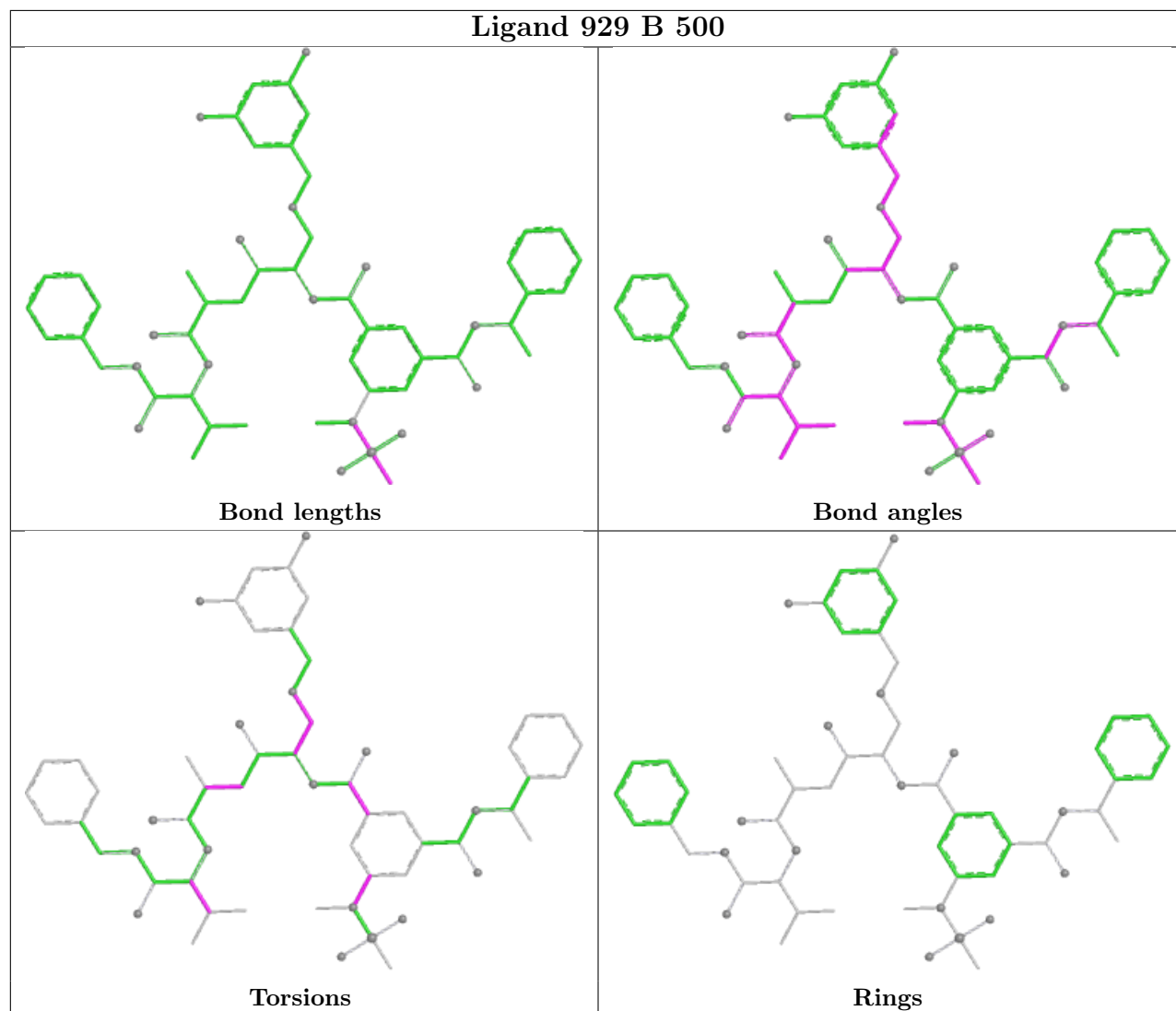
There are no ring outliers.

2 monomers are involved in 8 short contacts:

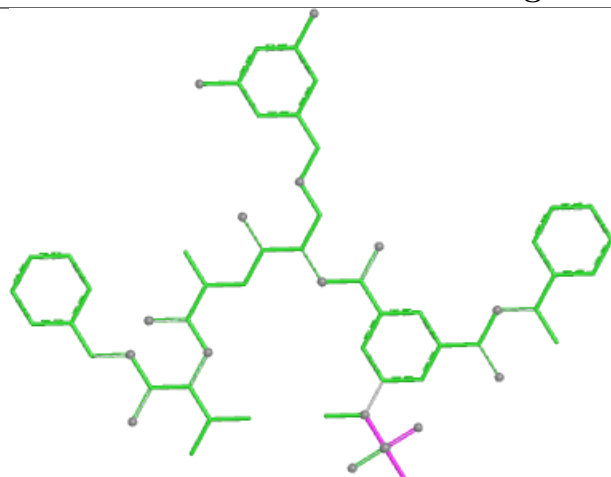
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	500	929	4	0
2	A	500	929	4	0

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

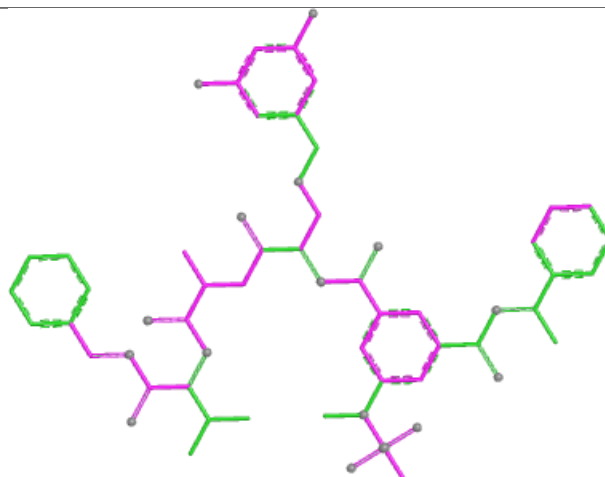
any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



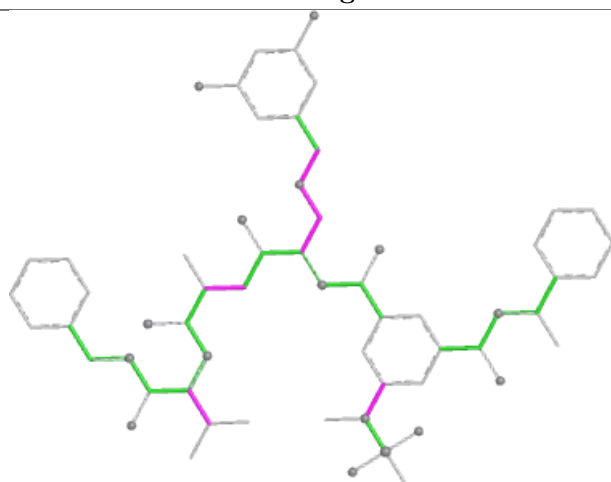
Ligand 929 A 500



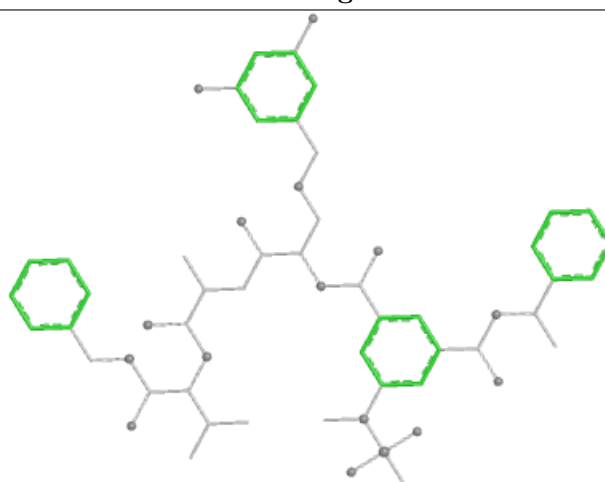
Bond lengths



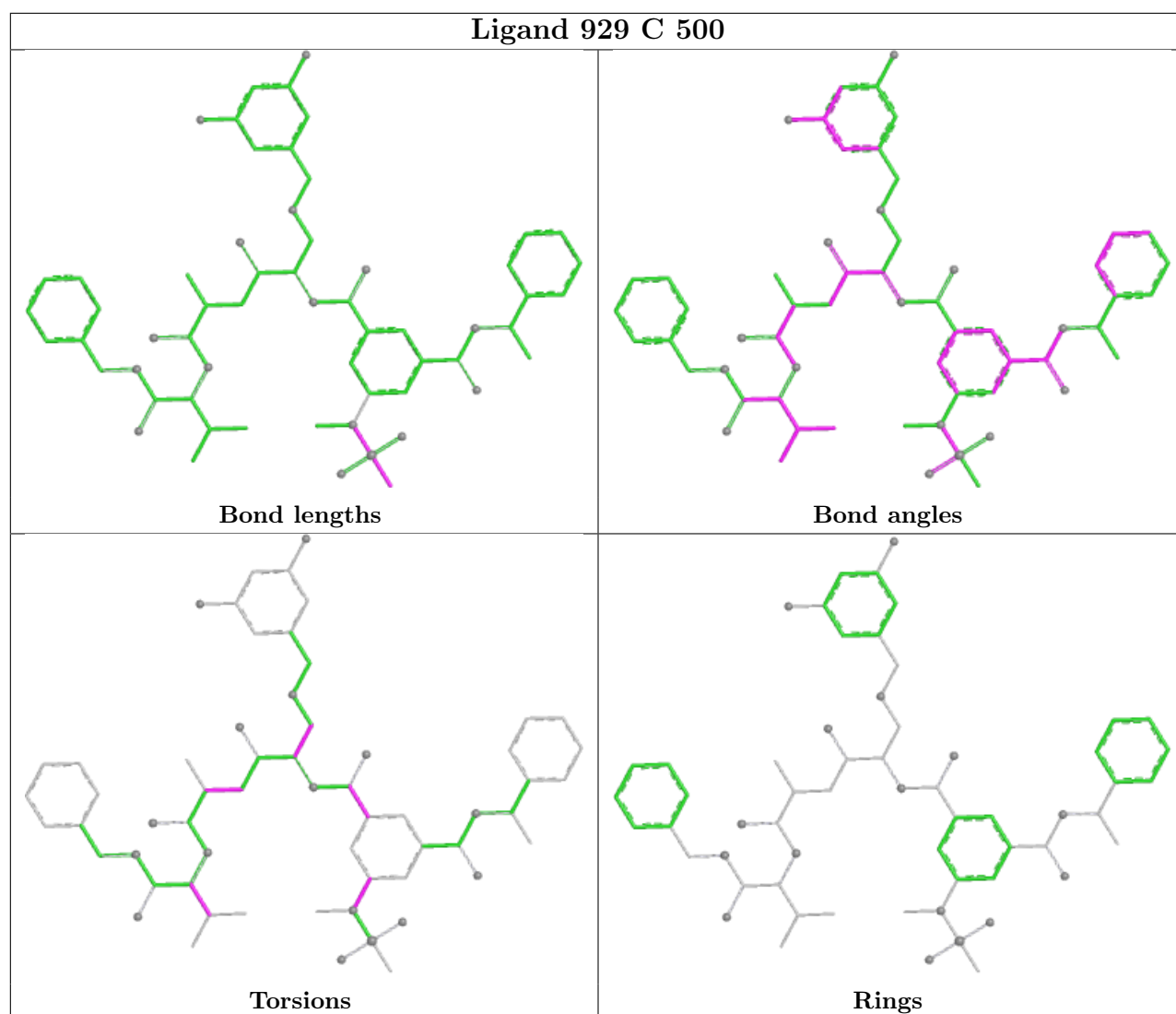
Bond angles



Torsions



Rings



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	373/405 (92%)	0.45	25 (6%) 24 21	16, 35, 62, 83	0
1	B	373/405 (92%)	0.33	21 (5%) 30 26	19, 35, 59, 79	0
1	C	371/405 (91%)	0.42	28 (7%) 20 18	16, 36, 66, 80	0
All	All	1117/1215 (91%)	0.40	74 (6%) 24 21	16, 36, 63, 83	0

All (74) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	205	ALA	5.8
1	A	306	PRO	4.9
1	A	409	VAL	4.5
1	A	363	SER	4.4
1	A	412	GLU	4.4
1	B	410	HIS	4.3
1	B	306	PRO	4.1
1	A	410	HIS	4.1
1	C	205	ALA	3.9
1	B	46	SER	3.8
1	A	364	GLN	3.7
1	C	97	HIS	3.7
1	A	358	GLU	3.7
1	A	413	PHE	3.5
1	C	320	ALA	3.4
1	C	302	THR	3.3
1	B	363	SER	3.3
1	B	304	LYS	3.3
1	C	305	PHE	3.2
1	A	97	HIS	3.2
1	B	97	HIS	3.2
1	C	315	LEU	3.2
1	B	205	ALA	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	413	PHE	3.0
1	C	46	SER	3.0
1	C	306	PRO	3.0
1	C	365	ASP	2.9
1	B	217	SER	2.8
1	C	358	GLU	2.8
1	A	217	SER	2.8
1	B	307	ASP	2.8
1	A	304	LYS	2.7
1	A	59	GLY	2.7
1	B	413	PHE	2.7
1	C	95	PHE	2.7
1	A	57	LYS	2.6
1	B	409	VAL	2.6
1	A	302	THR	2.6
1	B	305	PHE	2.6
1	B	302	THR	2.6
1	C	299	ALA	2.6
1	A	411	ASP	2.5
1	B	412	GLU	2.4
1	C	92	PRO	2.4
1	A	314	GLN	2.4
1	A	428	GLU	2.4
1	C	357	VAL	2.4
1	C	409	VAL	2.4
1	A	433	ASN	2.4
1	A	307	ASP	2.3
1	A	429	ASP	2.3
1	A	432	TYR	2.3
1	C	295	SER	2.3
1	B	321	GLY	2.3
1	A	408	HIS	2.3
1	B	52	ASP	2.3
1	C	96	LEU	2.3
1	C	307	ASP	2.3
1	C	112	ARG	2.3
1	C	317	CYS	2.2
1	B	358	GLU	2.2
1	B	320	ALA	2.2
1	C	290	GLU	2.1
1	C	297	LYS	2.1
1	C	304	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	94	PRO	2.1
1	A	55	ARG	2.1
1	C	303	GLU	2.1
1	C	428	GLU	2.1
1	A	113	LYS	2.1
1	B	262	LYS	2.1
1	C	319	GLN	2.0
1	B	316	VAL	2.0
1	B	355	ARG	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

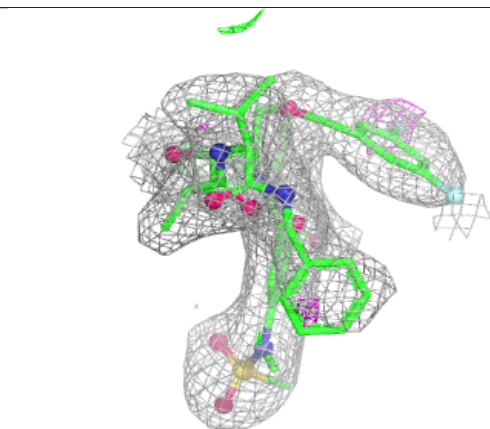
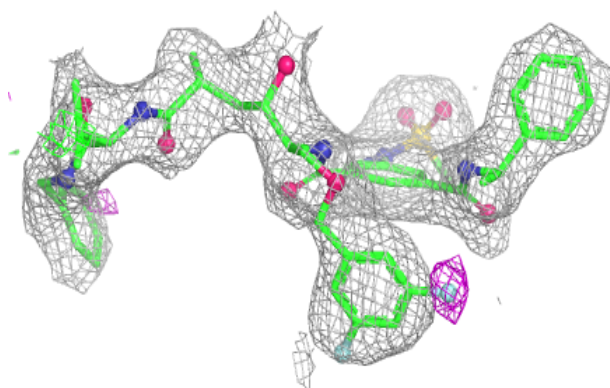
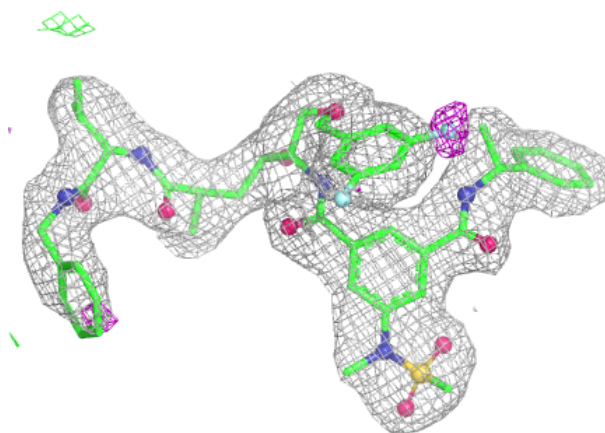
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	929	B	500	60/60	0.92	0.11	26,39,59,64	0
2	929	A	500	60/60	0.93	0.10	26,38,58,62	0
2	929	C	500	60/60	0.93	0.11	19,36,58,72	0

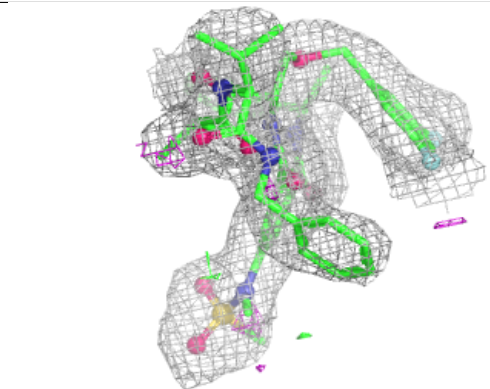
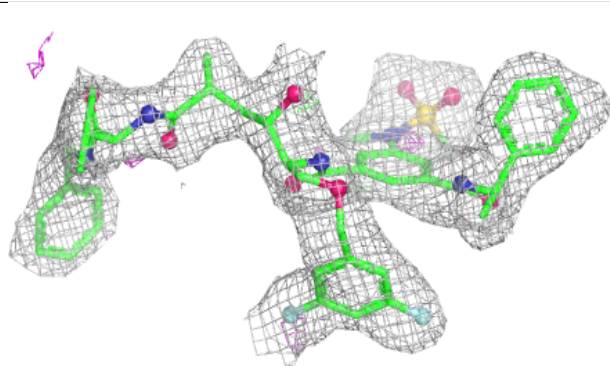
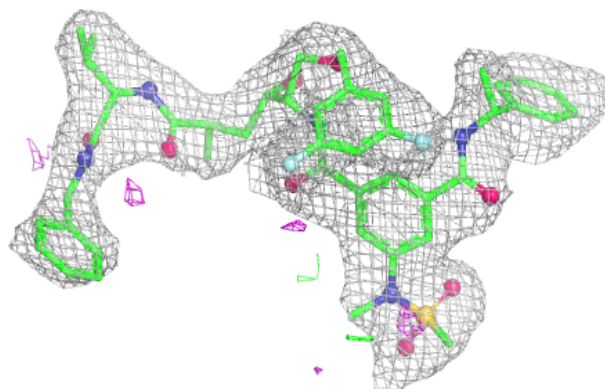
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around 929 B 500:

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

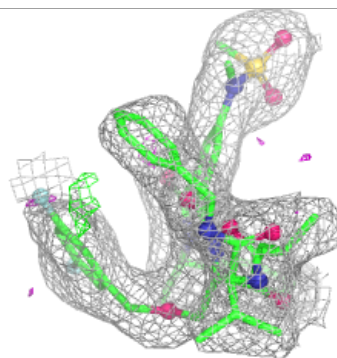
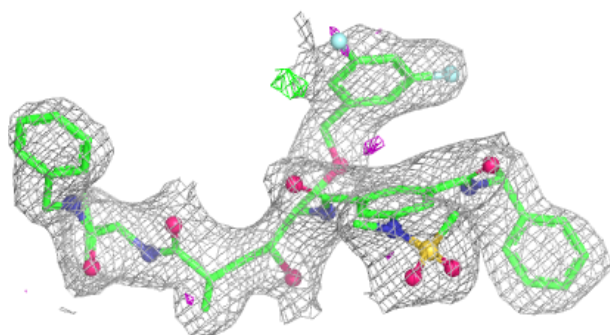
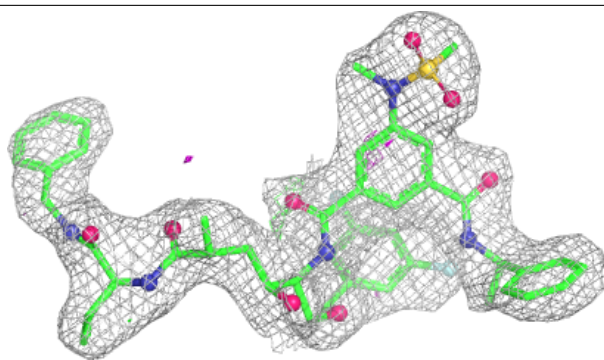
**Electron density around 929 A 500:**

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



Electron density around 929 C 500:

$2mF_o-DF_c$ (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.