



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2026 – 10:30 PM UTC

PDB ID : 2FJU / pdb_00002fju
Title : Activated Rac1 bound to its effector phospholipase C beta 2
Authors : Jezyk, M.R.; Snyder, J.T.; Harden, T.K.; Sondek, J.
Deposited on : 2006-01-03
Resolution : 2.20 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

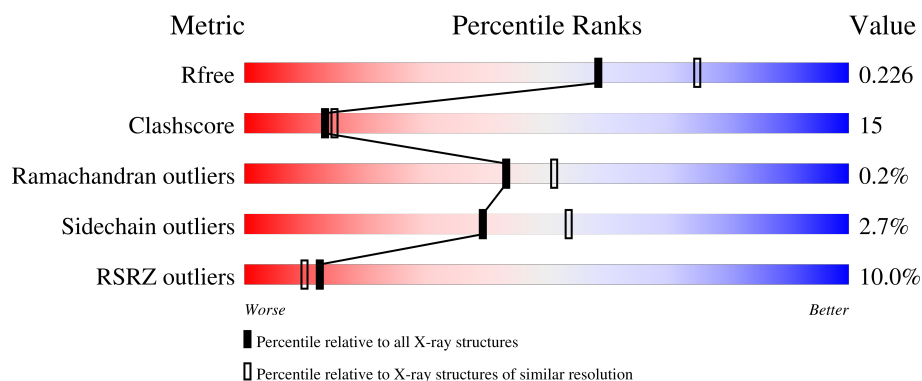
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	178	14% 78% 22%
2	B	799	8% 62% 21% •• 13%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7514 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 Ras-related C3 botulinum toxin substrate 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	177	Total	C	N	O	S	0	0	0
			1383	889	228	258	8			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	178	SER	-	insertion	UNP P63000

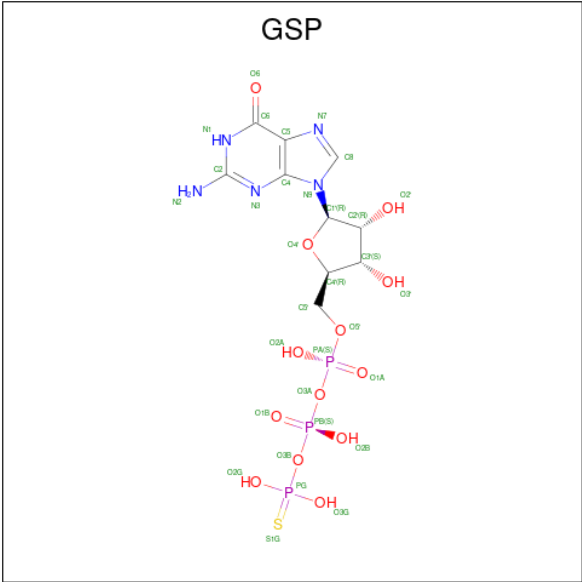
- Molecule 2 is a protein called 1-phosphatidylinositol-4,5-bisphosphate phosphodiesterase beta 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	696	Total	C	N	O	S	0	0	0
			5611	3602	928	1042	39			

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is 5'-GUANOSINE-DIPHOSPHATE-MONOTHIOPHOSPHATE (CCD ID: GSP) (formula: C₁₀H₁₆N₅O₁₃P₃S).



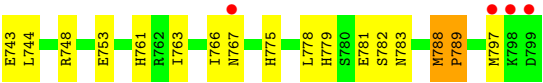
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
4	A	1	Total	C	N	O	P	S	0	0
			32	10	5	13	3	1		

- Molecule 5 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	Ca	0	0
			1	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	72	Total	O	0	0
			72	72		
6	B	414	Total	O	0	0
			414	414		



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	185.82Å 185.82Å 93.82Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	15.00 – 2.20 15.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	(Not available) (15.00-2.20) 99.2 (15.00-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.40 (at 2.20Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.208 , 0.226 0.209 , 0.226	Depositor DCC
R_{free} test set	4701 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	25.0	Xtriage
Anisotropy	0.182	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 49.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.020 for -h,-k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7514	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.61% 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: CA, GSP, MG

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	0.36	0/1413	0.89	2/1922 (0.1%)
2	B	0.71	8/5748 (0.1%)	1.14	47/7759 (0.6%)
All	All	0.66	8/7161 (0.1%)	1.09	49/9681 (0.5%)

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
2	B	0	5

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	194	LYS	C-N	29.94	1.84	1.34
2	B	191	PRO	C-N	29.05	1.72	1.33
2	B	196	ASP	C-N	10.90	1.48	1.33
2	B	195	ASN	C-N	9.68	1.46	1.33
2	B	192	LYS	C-N	7.29	1.44	1.33
2	B	195	ASN	C-O	5.71	1.31	1.24
2	B	291	MET	SD-CE	-5.27	1.66	1.79
2	B	193	GLY	C-N	-5.08	1.26	1.33

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	192	LYS	O-C-N	-25.86	88.95	122.83
2	B	333	ALA	CA-C-N	20.89	162.36	121.41
2	B	333	ALA	C-N-CA	20.89	162.36	121.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	195	ASN	O-C-N	-16.55	101.68	122.21
2	B	193	GLY	O-C-N	-14.45	103.92	122.70
2	B	30	THR	N-CA-C	10.91	126.30	108.52
2	B	205	GLU	N-CA-C	-10.41	96.95	110.07
2	B	194	LYS	CA-C-N	-10.38	101.68	121.81
2	B	194	LYS	C-N-CA	-10.38	101.68	121.81
2	B	191	PRO	CA-C-N	-10.18	107.91	122.06
2	B	191	PRO	C-N-CA	-10.18	107.91	122.06
2	B	192	LYS	CA-C-N	-9.49	102.81	121.41
2	B	192	LYS	C-N-CA	-9.49	102.81	121.41
2	B	191	PRO	O-C-N	9.24	133.63	123.01
2	B	195	ASN	CA-C-N	8.73	139.65	121.32
2	B	195	ASN	C-N-CA	8.73	139.65	121.32
2	B	28	ASP	N-CA-C	-7.66	103.03	112.38
2	B	47	LEU	N-CA-C	-7.21	96.77	108.52
2	B	55	GLU	N-CA-C	-7.16	99.88	110.48
2	B	322	PHE	N-CA-C	-6.84	98.11	109.46
2	B	29	GLU	CA-C-N	6.81	132.58	123.05
2	B	29	GLU	C-N-CA	6.81	132.58	123.05
2	B	175	PRO	N-CA-C	6.77	122.33	113.86
2	B	174	PHE	CA-C-N	6.73	126.35	119.56
2	B	174	PHE	C-N-CA	6.73	126.35	119.56
2	B	108	VAL	N-CA-C	6.58	117.92	111.67
2	B	104	GLY	CA-C-N	6.38	126.50	119.87
2	B	104	GLY	C-N-CA	6.38	126.50	119.87
2	B	788	MET	N-CA-C	6.27	120.75	112.35
1	A	97	TRP	N-CA-C	6.21	117.72	111.07
2	B	409	ASN	N-CA-C	5.92	118.37	108.96
2	B	193	GLY	CA-C-N	5.91	132.83	121.54
2	B	193	GLY	C-N-CA	5.91	132.83	121.54
2	B	735	VAL	N-CA-C	5.80	117.35	108.71
2	B	30	THR	N-CA-CB	-5.73	101.56	110.55
2	B	573	THR	N-CA-C	-5.72	102.83	110.55
2	B	274	TYR	N-CA-C	5.67	120.32	113.41
2	B	325	SER	N-CA-C	5.63	118.58	109.40
2	B	763	ILE	N-CA-C	-5.57	99.52	107.77
2	B	304	ALA	N-CA-C	-5.50	97.65	107.98
2	B	789	PRO	N-CA-C	5.35	119.59	111.19
2	B	29	GLU	N-CA-C	-5.33	99.45	110.80
2	B	740	LEU	N-CA-C	5.28	116.72	111.07
2	B	717	LYS	N-CA-C	-5.24	103.61	110.53
2	B	46	TYR	N-CA-C	5.21	117.73	109.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	643	GLU	N-CA-C	-5.15	105.74	112.23
1	A	72	TYR	N-CA-C	5.10	121.07	109.81
2	B	525	MET	N-CA-C	-5.07	108.12	114.56
2	B	766	ILE	N-CA-C	5.01	116.33	110.62

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	192	LYS	Mainchain
2	B	193	GLY	Mainchain
2	B	195	ASN	Mainchain
2	B	29	GLU	Peptide
2	B	333	ALA	Peptide

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	1383	0	1405	21	0
2	B	5611	0	5564	186	0
3	A	1	0	0	0	0
4	A	32	0	12	0	0
5	B	1	0	0	0	0
6	A	72	0	0	0	0
6	B	414	0	0	10	0
All	All	7514	0	6981	207	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 15.

All (207) 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)
2:B:191:PRO:C	2:B:192:LYS:N	1.72	1.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:194:LYS:C	2:B:195:ASN:N	1.84	1.36
2:B:173:MET:HE3	2:B:788:MET:HE2	1.46	0.96
2:B:82:ARG:HA	2:B:87:MET:HE2	1.53	0.90
2:B:92:ASN:HD22	2:B:94:PHE:H	1.14	0.89
2:B:573:THR:HG22	2:B:576:LYS:H	1.37	0.85
2:B:164:LYS:HE3	2:B:197:ALA:HB3	1.59	0.85
2:B:206:PRO:HB2	6:B:1240:HOH:O	1.78	0.84
2:B:573:THR:HG23	2:B:575:LEU:H	1.41	0.84
2:B:584:ALA:HB1	2:B:587:GLN:HG2	1.60	0.83
2:B:594:ARG:HH11	2:B:595:GLN:HE21	1.25	0.83
2:B:631:MET:HE2	2:B:782:SER:HA	1.59	0.82
2:B:168:LYS:HG2	2:B:172:GLN:HE21	1.44	0.81
2:B:596:MET:SD	2:B:622:GLN:HG3	2.21	0.80
2:B:291:MET:HE2	2:B:295:LEU:HG	1.63	0.79
2:B:151:ILE:HG12	2:B:173:MET:HE2	1.63	0.78
2:B:194:LYS:C	2:B:195:ASN:CA	2.56	0.78
2:B:30:THR:HG22	2:B:31:THR:HG23	1.66	0.78
2:B:76:PRO:HG2	2:B:87:MET:HE1	1.66	0.77
2:B:191:PRO:C	2:B:192:LYS:CA	2.57	0.76
2:B:312:HIS:HD2	2:B:652:LEU:H	1.34	0.76
2:B:193:GLY:O	2:B:195:ASN:N	2.19	0.75
2:B:82:ARG:HG2	2:B:87:MET:CE	2.16	0.74
2:B:218:ARG:HH11	2:B:218:ARG:HG3	1.52	0.74
2:B:193:GLY:C	2:B:195:ASN:N	2.47	0.73
2:B:218:ARG:NH2	2:B:775:HIS:HE1	1.87	0.72
2:B:76:PRO:HG2	2:B:87:MET:CE	2.20	0.72
2:B:584:ALA:HB1	2:B:587:GLN:CG	2.21	0.71
2:B:594:ARG:HH11	2:B:595:GLN:NE2	1.89	0.71
2:B:291:MET:HE2	2:B:295:LEU:CG	2.20	0.70
2:B:191:PRO:CA	2:B:192:LYS:N	2.55	0.70
2:B:29:GLU:HB2	2:B:32:VAL:HB	1.74	0.69
1:A:68:ARG:HB3	1:A:69:PRO:HD3	1.74	0.68
2:B:92:ASN:ND2	2:B:94:PHE:H	1.90	0.68
2:B:178:ARG:NH1	2:B:194:LYS:HE2	2.09	0.68
1:A:98:TYR:HB3	1:A:99:PRO:HD3	1.76	0.67
2:B:218:ARG:NH2	2:B:775:HIS:CE1	2.62	0.67
2:B:610:ASN:HB2	2:B:634:PRO:HG2	1.77	0.66
2:B:173:MET:CE	2:B:788:MET:HE2	2.25	0.66
2:B:573:THR:HG23	2:B:575:LEU:N	2.10	0.66
2:B:53:SER:O	2:B:54:LYS:HB2	1.95	0.65
2:B:517:LEU:HD21	2:B:534:LEU:HB3	1.77	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:594:ARG:HD2	2:B:595:GLN:HE21	1.61	0.65
2:B:597:SER:H	2:B:622:GLN:NE2	1.95	0.65
2:B:25:LYS:HE3	2:B:28:ASP:HB3	1.77	0.65
2:B:573:THR:CG2	2:B:576:LYS:H	2.11	0.63
2:B:291:MET:CE	2:B:294:PHE:HD2	2.11	0.63
2:B:373:THR:HG23	2:B:380:THR:O	1.98	0.62
2:B:716:THR:HG23	2:B:717:LYS:O	2.00	0.61
2:B:654:HIS:HB2	2:B:744:LEU:HD11	1.83	0.60
2:B:778:LEU:HD12	2:B:789:PRO:HB2	1.83	0.60
2:B:779:HIS:HD2	2:B:783:ASN:ND2	1.99	0.60
2:B:654:HIS:HD2	2:B:656:PHE:HB2	1.68	0.59
2:B:688:GLN:HG3	6:B:1028:HOH:O	2.02	0.59
2:B:153:VAL:O	2:B:157:MET:HB2	2.03	0.58
2:B:394:SER:HA	2:B:397:LYS:HG3	1.85	0.58
2:B:622:GLN:NE2	2:B:622:GLN:H	2.02	0.58
2:B:291:MET:CE	2:B:295:LEU:HG	2.33	0.58
2:B:74:LYS:O	2:B:75:MET:HE3	2.04	0.58
2:B:56:MET:HE1	2:B:157:MET:O	2.04	0.57
2:B:78:SER:O	2:B:82:ARG:HG3	2.04	0.57
2:B:680:LEU:C	2:B:680:LEU:HD13	2.30	0.57
2:B:779:HIS:HE1	6:B:1011:HOH:O	1.87	0.56
2:B:219:PRO:HA	2:B:222:ASP:OD2	2.05	0.56
2:B:218:ARG:NH1	2:B:220:GLU:OE1	2.38	0.56
2:B:631:MET:CE	2:B:782:SER:HA	2.35	0.56
1:A:1:MET:HE3	1:A:1:MET:HA	1.88	0.56
2:B:221:ILE:HD12	2:B:292:VAL:HG22	1.87	0.56
2:B:528:ASP:OD1	2:B:573:THR:HG21	2.06	0.56
2:B:206:PRO:HG3	6:B:1426:HOH:O	2.05	0.56
1:A:176:VAL:O	1:A:177:LEU:HB2	2.05	0.56
2:B:291:MET:HE1	2:B:294:PHE:HD2	1.71	0.55
2:B:631:MET:HE2	2:B:781:GLU:O	2.06	0.55
2:B:193:GLY:O	2:B:194:LYS:C	2.47	0.55
2:B:743:GLU:HA	2:B:767:ASN:HD22	1.72	0.55
2:B:335:GLN:O	2:B:374:HIS:HD2	1.90	0.55
2:B:194:LYS:CA	2:B:195:ASN:N	2.68	0.55
2:B:237:THR:H	2:B:240:HIS:HD2	1.55	0.55
2:B:597:SER:H	2:B:622:GLN:HE21	1.55	0.55
2:B:520:GLU:O	2:B:523:LYS:HB3	2.07	0.54
2:B:373:THR:HG22	2:B:374:HIS:H	1.72	0.54
2:B:743:GLU:N	2:B:767:ASN:ND2	2.56	0.54
2:B:307:LYS:HE3	6:B:1482:HOH:O	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:127:GLU:O	1:A:131:GLU:HG3	2.08	0.53
2:B:342:ALA:CB	2:B:386:GLU:HG2	2.38	0.53
1:A:176:VAL:O	1:A:177:LEU:CB	2.56	0.53
2:B:173:MET:O	2:B:788:MET:HE3	2.08	0.53
2:B:218:ARG:HG3	2:B:218:ARG:NH1	2.21	0.52
2:B:66:ASP:HB2	2:B:350:LEU:HD13	1.90	0.52
2:B:75:MET:HE2	2:B:94:PHE:CE2	2.45	0.51
2:B:376:PHE:CD1	2:B:522:ILE:HD12	2.46	0.51
2:B:698:TYR:CE1	2:B:715:ARG:HD2	2.46	0.51
2:B:178:ARG:O	2:B:182:GLU:HG3	2.10	0.51
2:B:75:MET:HE2	2:B:94:PHE:HE2	1.75	0.51
1:A:122:ASP:O	1:A:126:ILE:HG13	2.10	0.51
2:B:74:LYS:HD3	2:B:114:ASN:HD21	1.76	0.50
2:B:680:LEU:HD13	2:B:681:SER:N	2.27	0.50
2:B:164:LYS:HE3	2:B:197:ALA:CB	2.37	0.50
2:B:287:SER:HB2	2:B:288:PRO:HD2	1.92	0.50
2:B:614:GLN:HE21	2:B:637:GLN:HE22	1.59	0.50
2:B:151:ILE:HG23	2:B:173:MET:HE2	1.93	0.50
2:B:716:THR:CG2	2:B:717:LYS:O	2.59	0.50
1:A:161:THR:O	1:A:162:GLN:HB2	2.12	0.50
2:B:65:ARG:HD3	2:B:347:GLN:HE22	1.77	0.50
2:B:75:MET:CE	2:B:98:THR:HG21	2.41	0.50
2:B:191:PRO:C	2:B:192:LYS:HA	2.37	0.50
2:B:11:PRO:HD3	2:B:136:HIS:NE2	2.27	0.49
2:B:587:GLN:H	2:B:587:GLN:CD	2.19	0.49
1:A:142:GLY:HA3	1:A:154:TYR:CZ	2.47	0.49
2:B:65:ARG:HD3	2:B:347:GLN:NE2	2.28	0.49
2:B:357:GLU:C	2:B:358:LEU:HD12	2.37	0.49
2:B:319:ASN:HD22	2:B:319:ASN:H	1.60	0.49
2:B:362:LYS:HE2	6:B:1410:HOH:O	2.11	0.49
2:B:401:TYR:HB3	2:B:402:PRO:HD2	1.94	0.49
2:B:706:LEU:CD1	2:B:741:MET:HE3	2.43	0.49
2:B:218:ARG:HG2	2:B:221:ILE:HD12	1.95	0.49
2:B:27:ASP:C	2:B:29:GLU:N	2.68	0.48
2:B:82:ARG:HG2	2:B:87:MET:HE2	1.92	0.48
1:A:1:MET:HE1	1:A:50:PRO:C	2.37	0.48
1:A:139:TYR:HB3	1:A:140:PRO:HD3	1.95	0.48
2:B:82:ARG:HG2	2:B:87:MET:HE3	1.94	0.48
2:B:558:GLU:H	2:B:558:GLU:CD	2.20	0.48
2:B:327:HIS:O	2:B:328:ASN:C	2.56	0.48
2:B:82:ARG:NH1	2:B:87:MET:HE3	2.29	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:168:LYS:HG2	2:B:172:GLN:NE2	2.21	0.48
2:B:349:LEU:HD22	2:B:403:ILE:HD13	1.96	0.48
2:B:723:ASN:ND2	2:B:723:ASN:C	2.72	0.48
2:B:706:LEU:HD21	2:B:744:LEU:HD23	1.97	0.47
2:B:70:GLY:HA2	2:B:95:LEU:O	2.14	0.47
2:B:655:GLU:HB3	2:B:658:ARG:NH2	2.29	0.47
2:B:706:LEU:HD11	2:B:741:MET:HE3	1.96	0.47
2:B:291:MET:HE1	2:B:294:PHE:CD2	2.49	0.47
1:A:1:MET:HE2	1:A:52:ASN:N	2.29	0.47
2:B:76:PRO:HG2	2:B:87:MET:SD	2.55	0.47
2:B:304:ALA:O	2:B:307:LYS:HB2	2.14	0.47
2:B:723:ASN:HD21	2:B:726:ASN:H	1.62	0.47
2:B:250:ARG:O	2:B:251:ASP:O	2.32	0.47
2:B:655:GLU:HG3	6:B:1300:HOH:O	2.15	0.47
1:A:111:ILE:HD12	1:A:172:ALA:HA	1.97	0.47
1:A:12:GLY:O	1:A:13:ALA:HB3	2.15	0.46
1:A:37:PHE:C	1:A:37:PHE:CD1	2.93	0.46
2:B:368:GLU:HG3	2:B:415:ARG:NH2	2.29	0.46
2:B:152:LEU:HD11	2:B:156:LYS:HD2	1.97	0.46
2:B:53:SER:O	2:B:54:LYS:CB	2.63	0.46
2:B:213:MET:HG3	2:B:289:GLU:HG3	1.97	0.46
1:A:8:VAL:HG21	1:A:20:LEU:HD21	1.96	0.46
2:B:373:THR:HG22	2:B:374:HIS:N	2.31	0.46
2:B:522:ILE:O	2:B:526:GLN:HB2	2.15	0.46
2:B:194:LYS:N	2:B:195:ASN:N	2.64	0.46
2:B:236:MET:HG2	2:B:240:HIS:HB2	1.97	0.46
2:B:779:HIS:HD2	2:B:783:ASN:HD21	1.62	0.45
2:B:372:ILE:C	2:B:373:THR:HG1	2.25	0.45
2:B:243:LYS:HG2	2:B:247:GLN:OE1	2.17	0.45
2:B:75:MET:HE1	2:B:98:THR:HG21	1.99	0.45
2:B:191:PRO:HA	2:B:192:LYS:N	2.29	0.45
2:B:333:ALA:O	2:B:629:GLN:HG3	2.17	0.45
2:B:168:LYS:HE2	2:B:172:GLN:NE2	2.32	0.45
2:B:291:MET:HE3	2:B:294:PHE:HD2	1.80	0.44
1:A:56:TRP:CD1	1:A:56:TRP:N	2.86	0.44
2:B:194:LYS:C	2:B:195:ASN:HA	2.39	0.44
2:B:680:LEU:HD23	2:B:797:MET:SD	2.57	0.44
2:B:361:TRP:CZ2	2:B:375:GLY:HA3	2.53	0.44
2:B:385:LYS:O	2:B:389:GLU:HG3	2.18	0.44
2:B:520:GLU:OE2	2:B:523:LYS:HD3	2.18	0.43
2:B:75:MET:HE3	2:B:75:MET:HA	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:346:ARG:O	2:B:350:LEU:HG	2.17	0.43
2:B:701:VAL:HA	2:B:748:ARG:O	2.18	0.43
2:B:25:LYS:HE3	2:B:28:ASP:CB	2.44	0.43
2:B:518:ASP:OD1	2:B:519:GLU:N	2.52	0.43
2:B:186:SER:OG	2:B:192:LYS:HD3	2.18	0.43
2:B:692:GLU:HG2	6:B:1286:HOH:O	2.19	0.43
2:B:695:VAL:HG23	6:B:1205:HOH:O	2.17	0.43
2:B:138:LEU:HD22	2:B:138:LEU:N	2.34	0.43
2:B:49:TRP:CE2	2:B:57:GLU:HB3	2.54	0.43
1:A:19:LEU:HD11	1:A:157:CYS:SG	2.58	0.42
2:B:180:ARG:HH12	2:B:723:ASN:ND2	2.17	0.42
2:B:221:ILE:CD1	2:B:292:VAL:HG22	2.49	0.42
2:B:82:ARG:HA	2:B:87:MET:CE	2.38	0.42
2:B:250:ARG:HG2	2:B:251:ASP:N	2.35	0.42
2:B:743:GLU:CA	2:B:767:ASN:HD22	2.33	0.42
2:B:655:GLU:O	2:B:659:ARG:HG3	2.19	0.42
2:B:136:HIS:CE1	2:B:138:LEU:HB2	2.54	0.42
1:A:108:THR:HA	1:A:109:PRO:HD3	1.91	0.41
2:B:359:ASP:O	2:B:372:ILE:HA	2.19	0.41
2:B:743:GLU:CA	2:B:767:ASN:ND2	2.83	0.41
2:B:86:ASN:OD1	2:B:89:PHE:HB2	2.20	0.41
2:B:723:ASN:ND2	2:B:725:ILE:H	2.19	0.41
2:B:93:SER:HB2	2:B:96:LEU:HD12	2.03	0.41
2:B:27:ASP:O	2:B:29:GLU:O	2.39	0.41
2:B:218:ARG:NH1	2:B:218:ARG:CG	2.80	0.41
2:B:547:ASN:ND2	2:B:548:TYR:H	2.17	0.41
1:A:4:ILE:HD12	1:A:51:VAL:HG11	2.02	0.41
2:B:151:ILE:HG12	2:B:173:MET:CE	2.42	0.41
2:B:74:LYS:HD3	2:B:114:ASN:ND2	2.35	0.41
2:B:243:LYS:O	2:B:247:GLN:HG3	2.21	0.41
2:B:196:ASP:N	2:B:196:ASP:OD1	2.53	0.41
1:A:83:SER:HB3	1:A:86:SER:HB3	2.02	0.41
2:B:27:ASP:C	2:B:29:GLU:H	2.29	0.40
2:B:82:ARG:CA	2:B:87:MET:HE2	2.35	0.40
2:B:173:MET:HE3	2:B:788:MET:CE	2.34	0.40
2:B:335:GLN:O	2:B:374:HIS:CD2	2.74	0.40
2:B:20:GLY:HA2	2:B:39:ARG:HG2	2.04	0.40
2:B:680:LEU:C	2:B:680:LEU:CD1	2.95	0.40
2:B:753:GLU:HG3	6:B:1303:HOH:O	2.21	0.40
2:B:336:PHE:HB2	2:B:606:MET:HE2	2.03	0.40
2:B:418:ALA:O	2:B:422:GLU:HG3	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:518:ASP:H	2:B:521:GLU:HB2	1.86	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	175/178 (98%)	172 (98%)	3 (2%)	0	100	100
2	B	684/799 (86%)	654 (96%)	28 (4%)	2 (0%)	36	42
All	All	859/977 (88%)	826 (96%)	31 (4%)	2 (0%)	43	51

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	194	LYS
2	B	334	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	153/154 (99%)	151 (99%)	2 (1%)	61	76
2	B	629/717 (88%)	610 (97%)	19 (3%)	36	49
All	All	782/871 (90%)	761 (97%)	21 (3%)	39	53

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	67	LEU
1	A	160	LEU
2	B	75	MET
2	B	86	ASN
2	B	99	LEU
2	B	218	ARG
2	B	220	GLU
2	B	251	ASP
2	B	318	LEU
2	B	547	ASN
2	B	558	GLU
2	B	573	THR
2	B	587	GLN
2	B	655	GLU
2	B	680	LEU
2	B	688	GLN
2	B	713	ARG
2	B	715	ARG
2	B	716	THR
2	B	723	ASN
2	B	761	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (34) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	26	ASN
1	A	39	ASN
1	A	52	ASN
1	A	74	GLN
1	A	162	GLN
2	B	52	GLN
2	B	92	ASN
2	B	114	ASN
2	B	172	GLN
2	B	199	ASN
2	B	240	HIS
2	B	268	GLN
2	B	300	ASN
2	B	305	GLN
2	B	312	HIS
2	B	316	GLN

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Mol	Chain	Res	Type
2	B	319	ASN
2	B	347	GLN
2	B	374	HIS
2	B	547	ASN
2	B	595	GLN
2	B	614	GLN
2	B	622	GLN
2	B	638	ASN
2	B	647	GLN
2	B	688	GLN
2	B	723	ASN
2	B	756	ASN
2	B	761	HIS
2	B	767	ASN
2	B	770	ASN
2	B	775	HIS
2	B	779	HIS
2	B	783	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	$\# Z > 2$
4	GSP	A	2466	3	33,34,34	1.99	4 (12%)	47,54,54	1.44	6 (12%)

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
4	GSP	A	2466	3	-	2/21/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	2466	GSP	PB-O3B	8.77	1.69	1.59
4	A	2466	GSP	PA-O3A	-2.84	1.56	1.59
4	A	2466	GSP	C4-N3	2.34	1.39	1.34
4	A	2466	GSP	PG-O2G	-2.09	1.48	1.54

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	2466	GSP	O2B-PB-O3B	4.52	119.49	107.27
4	A	2466	GSP	O6-C6-N1	3.76	127.19	120.11
4	A	2466	GSP	O3B-PB-O1B	-3.33	100.68	110.70
4	A	2466	GSP	PB-O3B-PG	-2.51	123.98	133.17
4	A	2466	GSP	C1'-N9-C8	2.11	132.73	126.73
4	A	2466	GSP	O3G-PG-O3B	2.01	111.36	104.64

There are no chirality outliers.

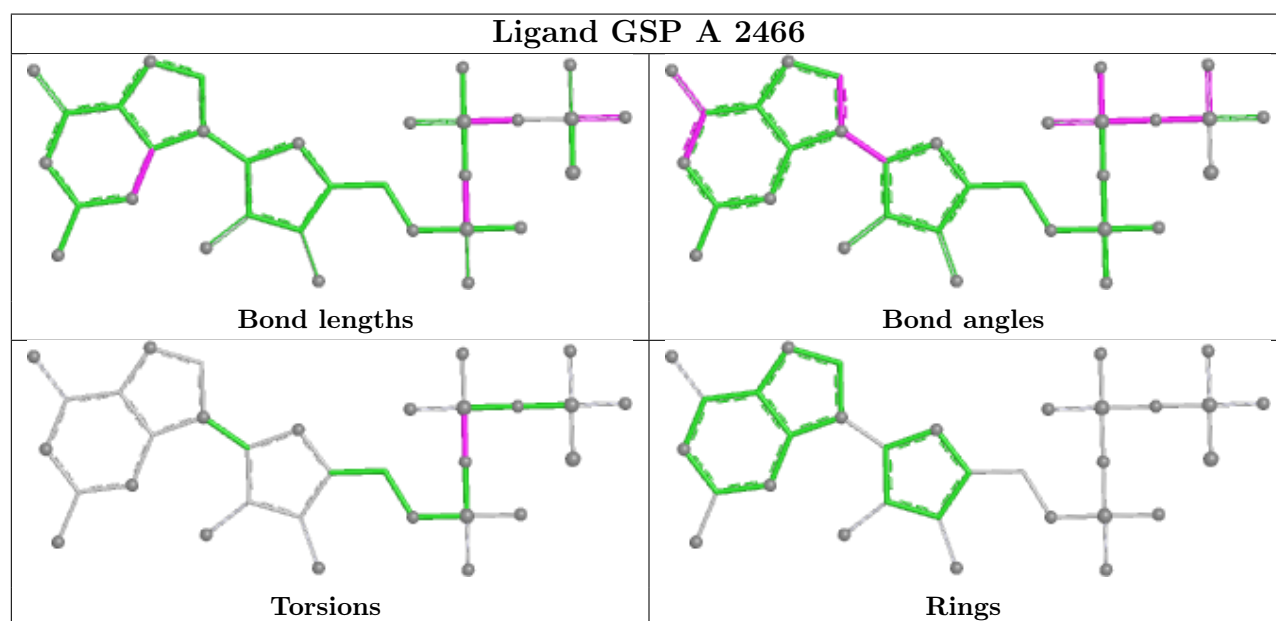
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	2466	GSP	PA-O3A-PB-O1B
4	A	2466	GSP	PA-O3A-PB-O2B

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for 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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	B	2

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	194:LYS	C	195:ASN	N	1.84

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Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	191:PRO	C	192:LYS	N	1.72

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	177/178 (99%)	0.35	25 (14%) 6 4	18, 28, 87, 108	0
2	B	696/799 (87%)	0.03	62 (8%) 15 13	13, 25, 68, 131	0
All	All	873/977 (89%)	0.10	87 (9%) 12 10	13, 26, 75, 131	0

All (87) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	235	TYR	9.1
2	B	28	ASP	8.9
2	B	29	GLU	8.3
2	B	251	ASP	8.2
2	B	227	SER	6.2
1	A	177	LEU	5.8
2	B	11	PRO	5.8
2	B	659	ARG	5.6
2	B	277	SER	5.5
2	B	89	PHE	5.5
2	B	522	ILE	5.5
1	A	48	GLY	5.4
2	B	512	GLU	5.3
1	A	128	LYS	5.1
1	A	121	ASP	5.1
2	B	205	GLU	5.0
2	B	518	ASP	5.0
2	B	222	ASP	4.6
1	A	123	LYS	4.6
1	A	43	ASN	4.5
2	B	524	LYS	4.4
2	B	333	ALA	4.4
2	B	655	GLU	4.3
1	A	49	LYS	4.3

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Mol	Chain	Res	Type	RSRZ
2	B	521	GLU	4.3
2	B	526	GLN	4.0
2	B	91	ASP	4.0
1	A	124	ASP	3.9
2	B	238	LYS	3.9
2	B	194	LYS	3.9
1	A	47	ASP	3.8
2	B	250	ARG	3.9
1	A	133	LYS	3.8
2	B	523	LYS	3.8
2	B	300	ASN	3.6
2	B	206	PRO	3.6
1	A	131	GLU	3.6
2	B	767	ASN	3.6
1	A	2	GLN	3.5
2	B	239	GLU	3.5
2	B	798	LYS	3.4
2	B	520	GLU	3.4
2	B	226	THR	3.2
1	A	30	GLY	3.2
2	B	196	ASP	3.2
2	B	660	PRO	3.1
2	B	27	ASP	3.1
2	B	30	THR	3.0
2	B	284	GLY	3.0
2	B	195	ASN	2.9
2	B	247	GLN	2.8
1	A	132	LYS	2.8
2	B	799	ASP	2.8
1	A	134	LEU	2.8
2	B	162	GLU	2.7
2	B	218	ARG	2.7
1	A	125	THR	2.7
2	B	519	GLU	2.6
1	A	63	ASP	2.5
1	A	130	LYS	2.5
1	A	31	GLU	2.5
2	B	339	LEU	2.5
2	B	285	GLN	2.4
1	A	127	GLU	2.4
2	B	178	ARG	2.4
2	B	90	PRO	2.3

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Mol	Chain	Res	Type	RSRZ
2	B	193	GLY	2.3
2	B	797	MET	2.3
2	B	240	HIS	2.3
1	A	61	GLN	2.3
2	B	88	ASP	2.3
2	B	77	LYS	2.3
2	B	80	LYS	2.3
2	B	69	PHE	2.2
2	B	527	SER	2.2
2	B	243	LYS	2.1
2	B	439	LYS	2.1
1	A	122	ASP	2.1
2	B	513	GLU	2.1
2	B	528	ASP	2.1
2	B	678	THR	2.1
1	A	1	MET	2.1
1	A	129	LEU	2.1
2	B	415	ARG	2.1
1	A	107	ASN	2.0
2	B	12	LYS	2.0
2	B	373	THR	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.

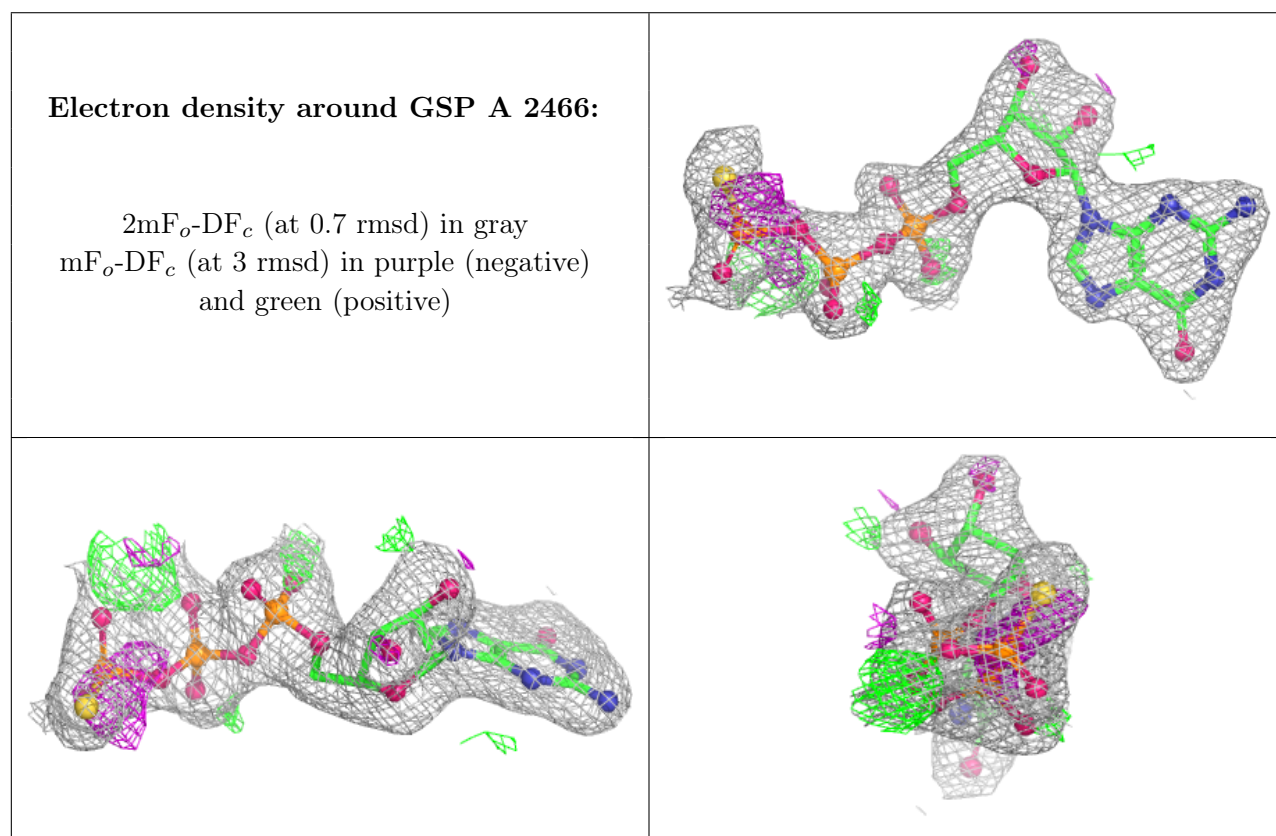
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	MG	A	179	1/1	0.53	0.20	29,29,29,29	0
4	GSP	A	2466	32/32	0.95	0.08	29,29,29,29	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	CA	B	1000	1/1	0.99	0.12	8,8,8,8	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.