



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 10:02 PM GMT

PDB ID : 1RW8
Title : Crystal Structure of TGF-beta receptor I kinase with ATP site inhibitor
Authors : Zhang, F.; Sawyer, J.S.
Deposited on : 2003-12-16
Resolution : 2.40 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

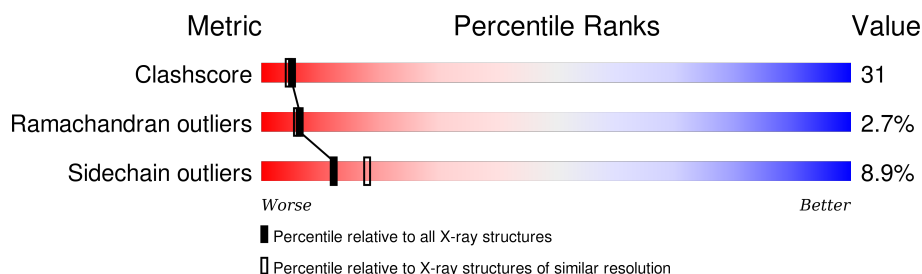
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	102246	3407 (2.40-2.40)
Ramachandran outliers	100387	3351 (2.40-2.40)
Sidechain outliers	100360	3352 (2.40-2.40)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	301	

2 Entry composition [i](#)

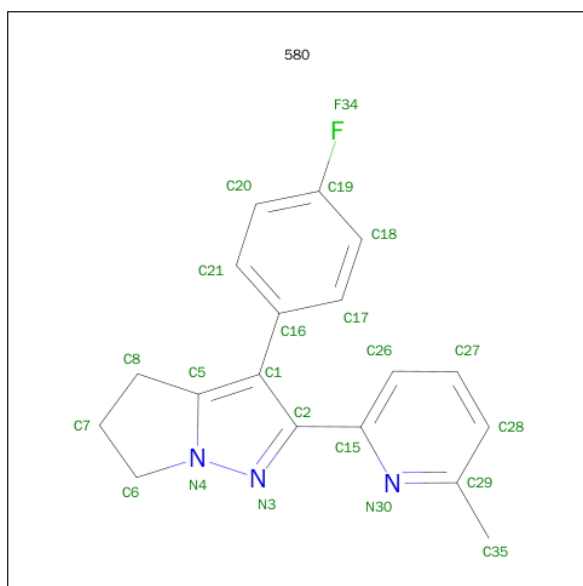
There are 3 unique types of molecules in this entry. The entry contains 2545 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 TGF-beta receptor type I.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	301	Total	C	N	O	S	0	0	0
			2418	1526	437	440	15			

- Molecule 2 is 3-(4-FLUOROPHENYL)-2-(6-METHYLPYRIDIN-2-YL)-5,6-DIHYDRO-4H-PYRROLO[1,2-B]PYRAZOLE (three-letter code: 580) (formula: C₁₈H₁₆FN₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	F	N	0	0
			22	18	1	3		

- Molecule 3 is water.

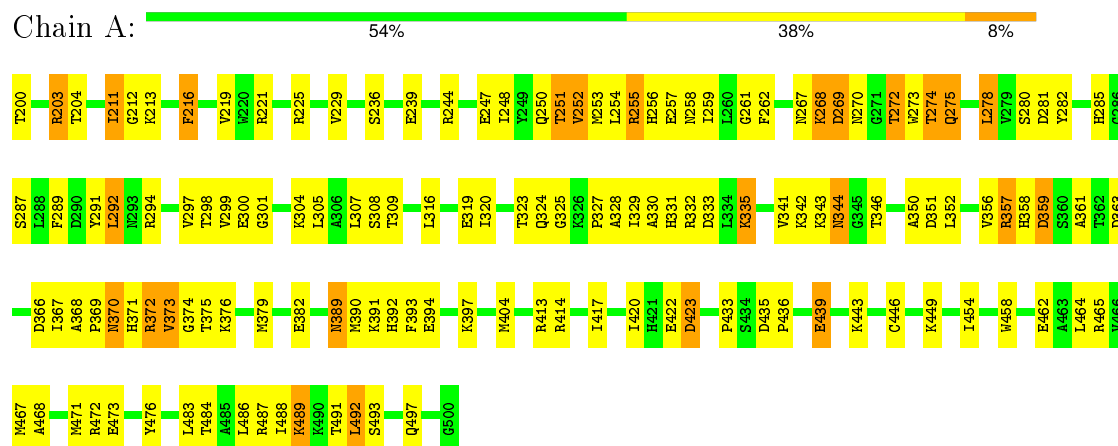
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	105	Total	O	0	0
			105	105		

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

- Molecule 1: TGF-beta receptor type I



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	41.96 Å 84.96 Å 84.08 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.40	Depositor
% Data completeness (in resolution range)	90.1 (20.00-2.40)	Depositor
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.260 , 0.291	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2545	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section:
580

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	0.38	0/2469	0.65	1/3332 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	269	ASP	CB-CG-OD1	5.77	123.50	118.30

There are no chirality outliers.

There are no planarity outliers.

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	2418	0	2412	149	0
2	A	22	0	16	4	0
3	A	105	0	0	14	0
All	All	2545	0	2428	149	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 31.

All (149) 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:A:370:ASN:HD21	1:A:372:ARG:HG2	1.23	1.04
1:A:373:VAL:HG22	1:A:374:GLY:H	1.23	1.00
1:A:203:ARG:NH1	1:A:268:LYS:HA	1.86	0.91
1:A:484:THR:HG23	1:A:487:ARG:H	1.39	0.86
1:A:278:LEU:HD22	2:A:501:580:H352	1.62	0.80
1:A:203:ARG:HH12	1:A:268:LYS:HA	1.48	0.78
1:A:369:PRO:HG3	3:A:85:HOH:O	1.83	0.78
1:A:252:VAL:HG13	1:A:327:PRO:HD2	1.65	0.77
1:A:204:THR:HB	3:A:25:HOH:O	1.83	0.77
1:A:247:GLU:O	1:A:251:THR:HG23	1.86	0.75
1:A:357:ARG:HB2	3:A:2:HOH:O	1.87	0.74
1:A:449:LYS:HE2	1:A:449:LYS:HA	1.68	0.73
1:A:373:VAL:HG22	1:A:374:GLY:N	2.02	0.73
1:A:417:ILE:O	1:A:420:ILE:HG22	1.90	0.72
1:A:370:ASN:HD21	1:A:372:ARG:CG	2.02	0.71
1:A:392:HIS:HB3	3:A:6:HOH:O	1.92	0.69
1:A:200:THR:O	1:A:204:THR:HG22	1.95	0.67
1:A:270:ASN:H	1:A:274:THR:HA	1.60	0.67
1:A:331:HIS:HD2	1:A:333:ASP:H	1.41	0.66
1:A:446:CYS:O	1:A:449:LYS:HE3	1.96	0.65
1:A:221:ARG:HG3	1:A:282:TYR:CE1	2.31	0.65
1:A:484:THR:CG2	1:A:487:ARG:H	2.10	0.64
1:A:413:ARG:NH1	1:A:423:ASP:O	2.29	0.64
1:A:320:ILE:O	1:A:325:GLY:HA3	1.98	0.64
1:A:298:THR:HG22	1:A:299:VAL:N	2.12	0.64
1:A:394:GLU:OE2	1:A:397:LYS:HE2	1.97	0.64
1:A:270:ASN:HB2	1:A:273:TRP:O	1.98	0.64
1:A:252:VAL:CG1	1:A:327:PRO:HD2	2.27	0.63
1:A:247:GLU:HG3	1:A:251:THR:HG21	1.79	0.63
1:A:285:HIS:CB	1:A:341:VAL:HG23	2.28	0.63
1:A:439:GLU:O	1:A:443:LYS:HG3	1.99	0.63
1:A:484:THR:HG22	1:A:487:ARG:CB	2.29	0.62
1:A:433:PRO:O	1:A:436:PRO:HG3	1.98	0.62
1:A:274:THR:O	1:A:275:GLN:CB	2.47	0.61
1:A:468:ALA:HA	1:A:471:MET:CE	2.31	0.61
1:A:254:LEU:HD21	1:A:316:LEU:HD23	1.82	0.61
1:A:363:ASP:O	1:A:363:ASP:OD1	2.18	0.61
1:A:255:ARG:HH11	1:A:255:ARG:HG2	1.66	0.61
1:A:309:THR:HG22	1:A:404:MET:HE2	1.81	0.61
1:A:254:LEU:HD22	1:A:259:ILE:HD13	1.81	0.61
1:A:274:THR:HG22	1:A:275:GLN:N	2.16	0.60
1:A:307:LEU:HD13	1:A:492:LEU:HB3	1.84	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:484:THR:HG22	1:A:487:ARG:HB2	1.84	0.60
1:A:372:ARG:HG3	1:A:372:ARG:O	2.01	0.59
1:A:225:ARG:HG2	1:A:225:ARG:HH11	1.66	0.59
1:A:335:LYS:HE3	1:A:375:THR:OG1	2.02	0.59
1:A:256:HIS:HD2	1:A:258:ASN:H	1.52	0.58
1:A:256:HIS:CD2	1:A:258:ASN:H	2.22	0.58
1:A:493:SER:O	1:A:497:GLN:HG3	2.04	0.57
1:A:250:GLN:C	1:A:252:VAL:H	2.08	0.57
1:A:343:LYS:HE3	3:A:10:HOH:O	2.04	0.57
1:A:212:GLY:HA3	1:A:219:VAL:HB	1.86	0.56
1:A:252:VAL:HG11	1:A:329:ILE:HD11	1.87	0.56
1:A:357:ARG:CB	3:A:2:HOH:O	2.50	0.56
1:A:489:LYS:O	1:A:489:LYS:HD2	2.06	0.55
1:A:468:ALA:HA	1:A:471:MET:HE3	1.87	0.55
1:A:291:TYR:CD1	1:A:341:VAL:HG21	2.42	0.54
1:A:285:HIS:HB3	1:A:341:VAL:CG2	2.38	0.54
1:A:454:ILE:HD13	1:A:472:ARG:NH1	2.22	0.53
1:A:382:GLU:CD	1:A:382:GLU:H	2.12	0.53
1:A:248:ILE:HG21	1:A:352:LEU:HB3	1.90	0.53
1:A:370:ASN:CG	1:A:371:HIS:N	2.62	0.52
1:A:319:GLU:OE2	1:A:327:PRO:HA	2.09	0.52
1:A:489:LYS:HD2	1:A:489:LYS:C	2.30	0.52
1:A:257:GLU:HG3	3:A:72:HOH:O	2.10	0.51
1:A:473:GLU:HA	1:A:476:TYR:CE2	2.45	0.51
1:A:454:ILE:HG12	1:A:471:MET:HE1	1.92	0.51
1:A:367:ILE:HG22	1:A:368:ALA:N	2.25	0.51
1:A:458:TRP:CD1	1:A:464:LEU:HD23	2.45	0.51
1:A:368:ALA:HB3	3:A:21:HOH:O	2.09	0.51
1:A:331:HIS:HD2	1:A:333:ASP:N	2.06	0.50
1:A:344:ASN:HD22	1:A:344:ASN:C	2.14	0.50
1:A:331:HIS:O	1:A:332:ARG:HB2	2.11	0.50
1:A:250:GLN:O	1:A:252:VAL:N	2.45	0.50
1:A:467:MET:O	1:A:471:MET:HG3	2.12	0.50
1:A:358:HIS:HB2	1:A:393:PHE:CD1	2.47	0.50
1:A:285:HIS:HB3	1:A:341:VAL:HG23	1.91	0.49
1:A:225:ARG:HG2	1:A:225:ARG:NH1	2.27	0.49
1:A:361:ALA:HB3	3:A:66:HOH:O	2.11	0.49
1:A:255:ARG:H	1:A:255:ARG:HD2	1.78	0.48
1:A:262:PHE:HE1	1:A:278:LEU:HD23	1.77	0.48
1:A:250:GLN:C	1:A:252:VAL:N	2.66	0.48
1:A:483:LEU:HD22	1:A:487:ARG:HG2	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:489:LYS:HE2	3:A:34:HOH:O	2.13	0.48
1:A:298:THR:HG22	1:A:299:VAL:H	1.79	0.47
1:A:292:LEU:O	1:A:414:ARG:HD2	2.14	0.47
1:A:468:ALA:HA	1:A:471:MET:HE2	1.96	0.47
1:A:253:MET:O	1:A:253:MET:HG2	2.14	0.47
1:A:435:ASP:N	1:A:436:PRO:HD3	2.28	0.47
1:A:298:THR:HG22	1:A:300:GLU:H	1.79	0.47
1:A:489:LYS:HG3	3:A:34:HOH:O	2.14	0.47
1:A:298:THR:CG2	1:A:299:VAL:N	2.77	0.47
1:A:335:LYS:CE	1:A:375:THR:OG1	2.62	0.47
1:A:344:ASN:ND2	1:A:346:THR:OG1	2.41	0.47
1:A:484:THR:HG22	1:A:487:ARG:HB3	1.96	0.47
1:A:261:GLY:HA3	1:A:281:ASP:OD2	2.14	0.47
1:A:473:GLU:HB3	1:A:483:LEU:HG	1.97	0.46
1:A:359:ASP:HB3	3:A:66:HOH:O	2.15	0.46
1:A:267:ASN:O	1:A:269:ASP:N	2.49	0.46
1:A:272:THR:HB	1:A:273:TRP:HE3	1.81	0.46
1:A:351:ASP:HB2	2:A:501:580:H62	1.96	0.46
1:A:468:ALA:HB1	1:A:472:ARG:HH12	1.81	0.46
1:A:255:ARG:N	1:A:255:ARG:HD2	2.31	0.46
1:A:300:GLU:O	1:A:304:LYS:HG2	2.16	0.46
1:A:216:PHE:CD2	1:A:372:ARG:NE	2.83	0.45
1:A:297:VAL:HG22	1:A:298:THR:N	2.31	0.45
1:A:236:SER:O	1:A:239:GLU:HB2	2.16	0.45
1:A:413:ARG:NH1	1:A:422:GLU:HB3	2.32	0.45
1:A:330:ALA:HB3	1:A:356:VAL:CG2	2.46	0.45
1:A:258:ASN:ND2	1:A:308:SER:HB2	2.31	0.45
1:A:331:HIS:HE1	1:A:350:ALA:O	1.99	0.45
1:A:292:LEU:O	1:A:414:ARG:CD	2.65	0.45
1:A:229:VAL:HG22	1:A:280:SER:O	2.17	0.45
1:A:373:VAL:CG2	1:A:374:GLY:H	2.07	0.44
1:A:331:HIS:CD2	1:A:333:ASP:H	2.27	0.44
1:A:274:THR:O	1:A:275:GLN:HB3	2.17	0.44
1:A:342:LYS:NZ	1:A:346:THR:OG1	2.50	0.44
1:A:319:GLU:HB2	1:A:328:ALA:HB2	2.00	0.44
1:A:212:GLY:CA	1:A:219:VAL:HB	2.47	0.44
1:A:285:HIS:HB2	1:A:341:VAL:HG23	1.99	0.44
1:A:376:LYS:HA	1:A:379:MET:HG3	2.00	0.44
1:A:255:ARG:HG2	1:A:255:ARG:NH1	2.31	0.44
1:A:211:ILE:HD12	2:A:501:580:H20	1.98	0.43
1:A:272:THR:HB	1:A:273:TRP:CE3	2.52	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:203:ARG:HD3	1:A:203:ARG:N	2.33	0.43
1:A:244:ARG:HG2	1:A:369:PRO:HD2	2.00	0.43
1:A:274:THR:O	1:A:275:GLN:HB2	2.18	0.43
1:A:370:ASN:ND2	1:A:372:ARG:NH1	2.66	0.43
1:A:327:PRO:HB2	1:A:357:ARG:HG2	2.01	0.43
1:A:359:ASP:CB	3:A:66:HOH:O	2.67	0.43
1:A:488:ILE:O	1:A:492:LEU:HB2	2.19	0.43
1:A:389:ASN:HD21	1:A:391:LYS:HB3	1.83	0.42
1:A:229:VAL:CG2	1:A:280:SER:O	2.67	0.42
1:A:213:LYS:HE3	2:A:501:580:H61	2.02	0.42
1:A:389:ASN:C	1:A:391:LYS:H	2.23	0.42
1:A:332:ARG:HA	3:A:31:HOH:O	2.20	0.42
1:A:462:GLU:OE2	1:A:465:ARG:NH2	2.52	0.42
1:A:472:ARG:HH11	1:A:472:ARG:HG3	1.84	0.42
1:A:359:ASP:O	1:A:363:ASP:N	2.53	0.41
1:A:370:ASN:ND2	1:A:372:ARG:HG2	2.08	0.41
1:A:492:LEU:HD12	1:A:492:LEU:HA	1.77	0.41
1:A:319:GLU:HG3	1:A:320:ILE:N	2.35	0.41
1:A:203:ARG:H	1:A:203:ARG:HD3	1.85	0.41
1:A:341:VAL:O	1:A:341:VAL:HG23	2.20	0.41
1:A:304:LYS:HE2	1:A:304:LYS:HB3	1.95	0.41
1:A:287:SER:OG	1:A:289:PHE:HB3	2.21	0.41
1:A:373:VAL:CG2	1:A:374:GLY:N	2.73	0.40
1:A:301:GLY:O	1:A:305:LEU:HG	2.22	0.40
1:A:376:LYS:HA	1:A:379:MET:SD	2.61	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	299/301 (99%)	271 (91%)	20 (7%)	8 (3%)	6 6

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	274	THR
1	A	323	THR
1	A	251	THR
1	A	268	LYS
1	A	275	GLN
1	A	372	ARG
1	A	373	VAL
1	A	390	MET

5.3.2 Protein sidechains ⓘ

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	257/257 (100%)	234 (91%)	23 (9%)	12	18

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	203	ARG
1	A	211	ILE
1	A	216	PHE
1	A	252	VAL
1	A	255	ARG
1	A	272	THR
1	A	278	LEU
1	A	292	LEU
1	A	294	ARG
1	A	324	GLN
1	A	335	LYS
1	A	344	ASN
1	A	357	ARG
1	A	359	ASP
1	A	366	ASP
1	A	370	ASN
1	A	389	ASN

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Mol	Chain	Res	Type
1	A	423	ASP
1	A	439	GLU
1	A	486	LEU
1	A	489	LYS
1	A	491	THR
1	A	492	LEU

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

Mol	Chain	Res	Type
1	A	208	GLN
1	A	256	HIS
1	A	324	GLN
1	A	331	HIS
1	A	344	ASN
1	A	370	ASN
1	A	389	ASN
1	A	448	GLN
1	A	456	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link

column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	580	A	501	-	22,25,25	2.39	6 (27%)	26,36,36	1.62	5 (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	580	A	501	-	-	0/6/14/14	0/4/4/4

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	580	C5-N4	-3.03	1.33	1.37
2	A	501	580	C21-C20	2.19	1.42	1.38
2	A	501	580	C20-C19	2.40	1.41	1.37
2	A	501	580	C15-N30	2.85	1.38	1.34
2	A	501	580	C2-N3	3.11	1.37	1.35
2	A	501	580	C1-C2	8.12	1.51	1.41

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	580	C26-C15-N30	-2.30	118.84	122.01
2	A	501	580	C26-C15-C2	2.50	123.72	120.63
2	A	501	580	C6-C7-C8	2.59	110.21	105.52
2	A	501	580	C5-N4-N3	4.01	116.81	112.10
2	A	501	580	C15-N30-C29	4.76	122.80	118.54

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	580	4	0

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.