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wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 31, 2024 – 12:24 PM EDT

PDB ID	:	8SSV
Title	:	Crystal structure of Grp94 N-terminal domain bound to the purine inhibitor PU-H71.
Authors	:	Que, N.L.S.; Gewirth, D.T.
Deposited on	:	2023-05-09
Resolution	:	1.72 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

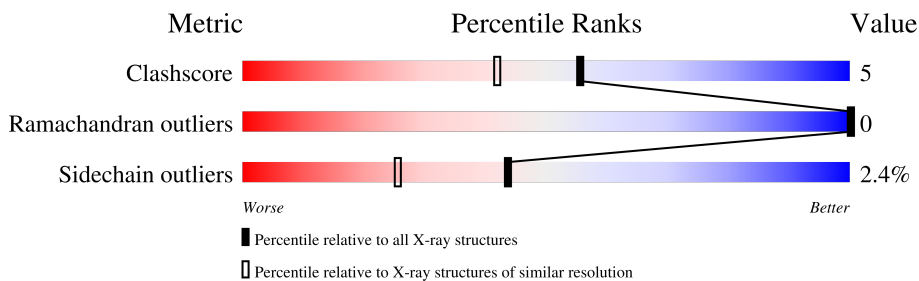|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	FAILED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 1.72 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	Percentile Ranks	Value
Clashscore		5
Ramachandran outliers		0
Sidechain outliers		2.4%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	180529	7746 (1.74-1.70)
Ramachandran outliers	177936	7654 (1.74-1.70)
Sidechain outliers	177891	7654 (1.74-1.70)

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 <=5%

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	236	76% 10% 14%
1	B	236	78% 10% 11%

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2 Entry composition ⓘ

There are 8 unique types of molecules in this entry. The entry contains 3409 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 Endoplasmin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	203	Total	C	N	O	S	8	4	0
			1539	974	257	304	4			
1	B	209	Total	C	N	O	S	8	3	0
			1560	986	265	304	5			

There are 90 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	65	GLY	-	expression tag	UNP P41148
A	66	SER	-	expression tag	UNP P41148
A	67	HIS	-	expression tag	UNP P41148
A	68	MET	-	expression tag	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	THR	deletion	UNP P41148
A	?	-	VAL	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	PRO	deletion	UNP P41148
A	?	-	MET	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	ALA	deletion	UNP P41148
A	?	-	ALA	deletion	UNP P41148
A	?	-	LYS	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	LYS	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	ASP	deletion	UNP P41148
A	?	-	SER	deletion	UNP P41148
A	?	-	ASP	deletion	UNP P41148

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Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	ASP	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	ALA	deletion	UNP P41148
A	?	-	ALA	deletion	UNP P41148
A	?	-	VAL	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	GLU	deletion	UNP P41148
A	?	-	LYS	deletion	UNP P41148
A	?	-	LYS	deletion	UNP P41148
A	?	-	PRO	deletion	UNP P41148
A	?	-	LYS	deletion	UNP P41148
A	?	-	THR	deletion	UNP P41148
A	324	GLY	LYS	conflict	UNP P41148
A	325	GLY	LYS	conflict	UNP P41148
A	326	GLY	VAL	conflict	UNP P41148
A	327	GLY	GLU	conflict	UNP P41148
B	65	GLY	-	expression tag	UNP P41148
B	66	SER	-	expression tag	UNP P41148
B	67	HIS	-	expression tag	UNP P41148
B	68	MET	-	expression tag	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	THR	deletion	UNP P41148
B	?	-	VAL	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	PRO	deletion	UNP P41148
B	?	-	MET	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	ALA	deletion	UNP P41148
B	?	-	ALA	deletion	UNP P41148
B	?	-	LYS	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	LYS	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	ASP	deletion	UNP P41148
B	?	-	SER	deletion	UNP P41148
B	?	-	ASP	deletion	UNP P41148
B	?	-	ASP	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	ALA	deletion	UNP P41148
B	?	-	ALA	deletion	UNP P41148
B	?	-	VAL	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	GLU	deletion	UNP P41148
B	?	-	LYS	deletion	UNP P41148
B	?	-	LYS	deletion	UNP P41148
B	?	-	PRO	deletion	UNP P41148
B	?	-	LYS	deletion	UNP P41148
B	?	-	THR	deletion	UNP P41148
B	324	GLY	LYS	conflict	UNP P41148
B	325	GLY	LYS	conflict	UNP P41148
B	326	GLY	VAL	conflict	UNP P41148
B	327	GLY	GLU	conflict	UNP P41148

- Molecule 2 is 8-[(6-IODO-1,3-BENZODIOXOL-5-YL)THIO]-9-[3-(ISOPROPYLAMINO)PROPYL]-9H-PURIN-6-AMINE (three-letter code: H71) (formula: $C_{18}H_{21}IN_6O_2S$) (labeled as "Ligand of Interest" by depositor).
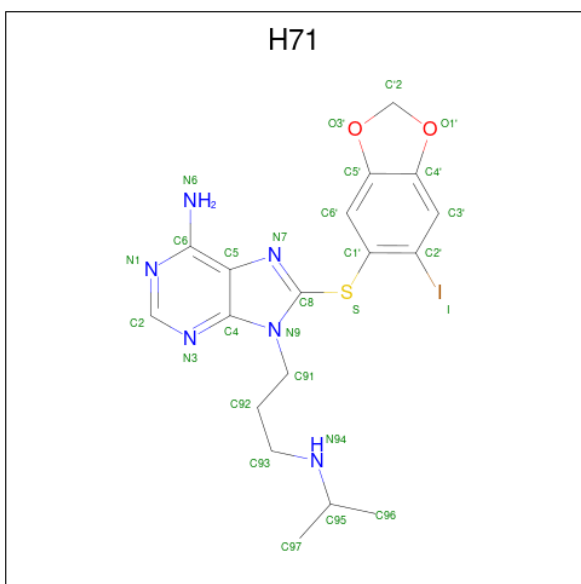
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	I	N	O	S	0	0
			28	18	1	6	2	1		
2	B	1	Total	C	I	N	O	S	0	0
			28	18	1	6	2	1		

- Molecule 3 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: $C_8H_{18}O_5$).
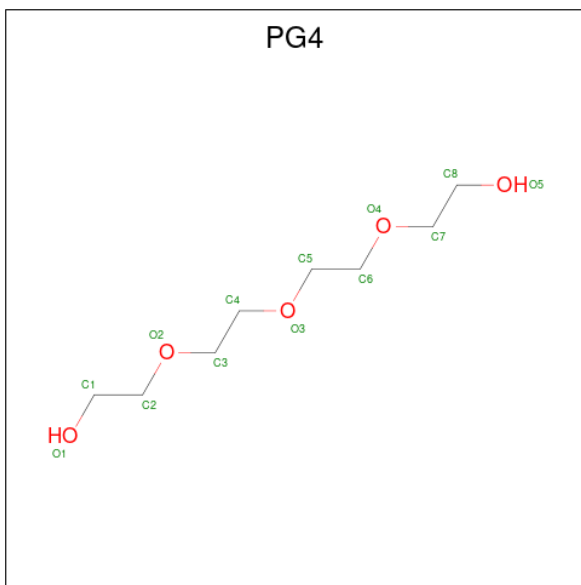
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			10	6	4		
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Ca	0	0
			1	1		
4	B	2	Total	Ca	0	0
			2	2		

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).

ACT

OXT

O⁻

C

CH3

O

O
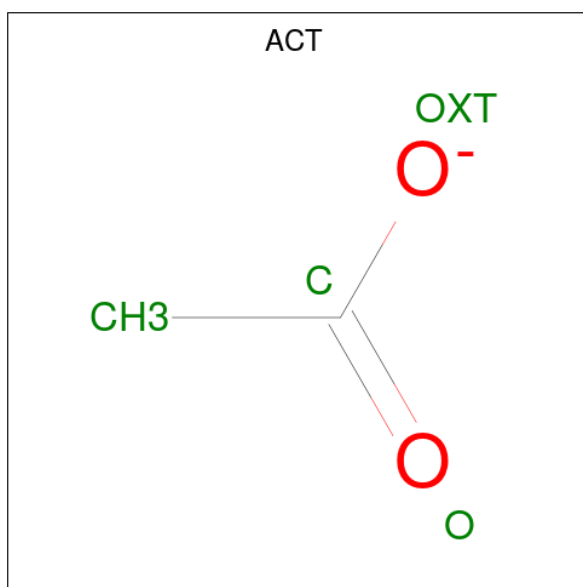
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total 4	C 2	O 2	0	0
5	B	1	Total 4	C 2	O 2	0	0

• Molecule 6 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: $C_4H_{10}O_3$).

PEG

C4

OH O4

O2

O

C3

C1

C2

HO

O1
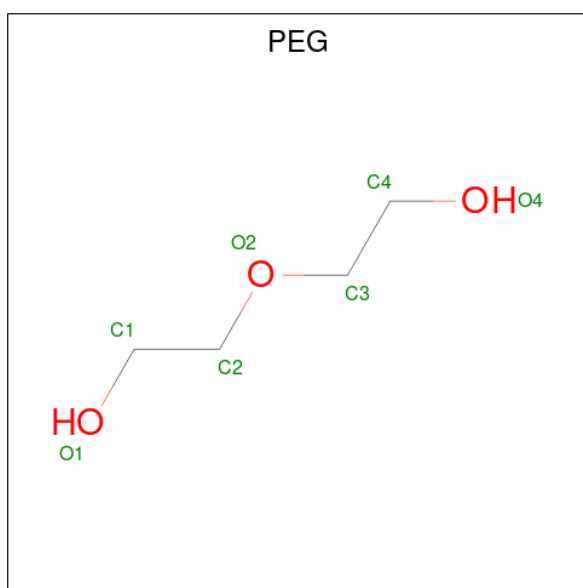
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total 7	C 4	O 3	0	0
6	B	1	Total 7	C 4	O 3	0	0

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• Molecule 7 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total Mg 1 1	0	0

• Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	95	Total O 95 95	0	0
8	B	102	Total O 102 102	0	0

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. 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. 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 failed to run properly.

• Molecule 1: Endoplasmin

Chain A:
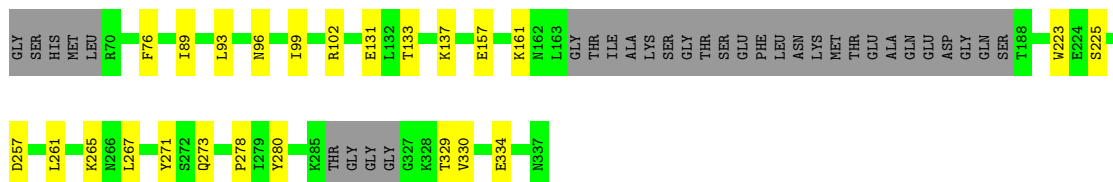
• Molecule 1: Endoplasmin

Chain B:
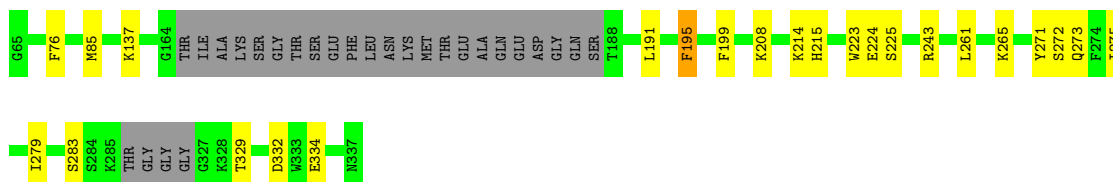
4 Data and refinement statistics ⓘ

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	51.90Å 65.43Å 75.38Å 90.00° 95.20° 90.00°	Depositor
Resolution (Å)	75.07 – 1.72	Depositor
% Data completeness (in resolution range)	44.4 (75.07-1.72)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$<I/\sigma(I)>$ [1]	0.11 (at 1.72Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.209 , 0.252	Depositor
Wilson B-factor (Å^2)	18.8	Xtriage
Anisotropy	0.728	Xtriage
L-test for twinning[2]	$<|L|> = 0.50$, $<L^2> = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3409	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.06% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $<|L|>$, $<L^2>$ 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: H71, PG4, CA, ACT, PEG, 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	0.34	0/1560	0.59	0/2116
1	B	0.34	0/1581	0.59	0/2142
All	All	0.34	0/3141	0.59	0/4258

There are no bond length outliers.

There are no bond angle outliers.

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	1539	0	1425	16	0
1	B	1560	0	1430	13	0
2	A	28	0	21	0	0
2	B	28	0	21	0	0
3	A	24	0	31	1	0
3	B	7	0	8	0	0
4	A	1	0	0	0	0
4	B	2	0	0	0	0
5	B	8	0	6	0	0
6	B	14	0	20	1	0
7	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	A	95	0	0	0	0
8	B	102	0	0	1	0
All	All	3409	0	2962	28	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 5.

The worst 5 of 28 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:273:GLN:HA	1:B:273:GLN:HG3	1.89	0.55
1:A:137:LYS:NZ	3:A:404:PG4:H12	2.25	0.52
1:B:191:LEU:O	1:B:195:PHE:HB2	2.10	0.52
1:A:99[B]:ILE:HD11	1:A:102:ARG:NH1	2.24	0.52
1:B:208:LYS:NZ	1:B:224:GLU:OE1	2.43	0.51

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	201/236 (85%)	192 (96%)	9 (4%)	0	100	100
1	B	206/236 (87%)	197 (96%)	9 (4%)	0	100	100
All	All	407/472 (86%)	389 (96%)	18 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	152/207 (73%)	150 (99%)	2 (1%)	65	51
1	B	150/207 (72%)	145 (97%)	5 (3%)	33	14
All	All	302/414 (73%)	295 (98%)	7 (2%)	44	27

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	85	MET
1	B	195	PHE
1	B	272	SER
1	B	199	PHE
1	B	76	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 ⓘ

Of 14 ligands modelled in this entry, 4 are monoatomic - leaving 10 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	#$|Z| > 2$
3	PG4	A	404	-	6,6,12	0.13	0	5,5,11	0.13	0
3	PG4	A	402	-	9,9,12	0.13	0	8,8,11	0.47	0
2	H71	B	401	-	25,31,31	1.65	5 (20%)	30,44,44	1.53	5 (16%)
2	H71	A	401	-	25,31,31	1.71	6 (24%)	30,44,44	1.24	2 (6%)
5	ACT	B	408	4	3,3,3	1.39	0	3,3,3	1.28	0
6	PEG	B	405	-	6,6,6	0.15	0	5,5,5	0.05	0
5	ACT	B	403	-	3,3,3	1.60	1 (33%)	3,3,3	1.35	0
3	PG4	A	403	-	6,6,12	0.15	0	5,5,11	0.08	0
3	PG4	B	404	-	6,6,12	0.10	0	5,5,11	0.81	0
6	PEG	B	406	-	6,6,6	0.16	0	5,5,5	0.10	0

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
3	PG4	A	404	-	-	2/4/4/10	-
3	PG4	A	402	-	-	3/7/7/10	-
2	H71	B	401	-	-	4/9/17/17	0/4/4/4
2	H71	A	401	-	-	5/9/17/17	0/4/4/4
6	PEG	B	405	-	-	2/4/4/4	-
3	PG4	A	403	-	-	1/4/4/10	-
3	PG4	B	404	-	-	2/4/4/10	-
6	PEG	B	406	-	-	1/4/4/4	-

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	H71	O1'-C4'	4.49	1.45	1.38
2	B	401	H71	O1'-C4'	3.91	1.44	1.38
2	A	401	H71	C2-N3	3.35	1.37	1.32
2	B	401	H71	C2-N3	3.30	1.37	1.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	H71	O3'-C5'	2.82	1.42	1.38

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	401	H71	C8-S-C1'	5.13	110.58	102.02
2	A	401	H71	C8-S-C1'	3.95	108.61	102.02
2	B	401	H71	C2'-C1'-S	2.48	127.19	120.82
2	B	401	H71	C5-C6-N6	2.48	124.09	120.31
2	B	401	H71	C'2-O1'-C4'	-2.36	102.16	105.32

There are no chirality outliers.
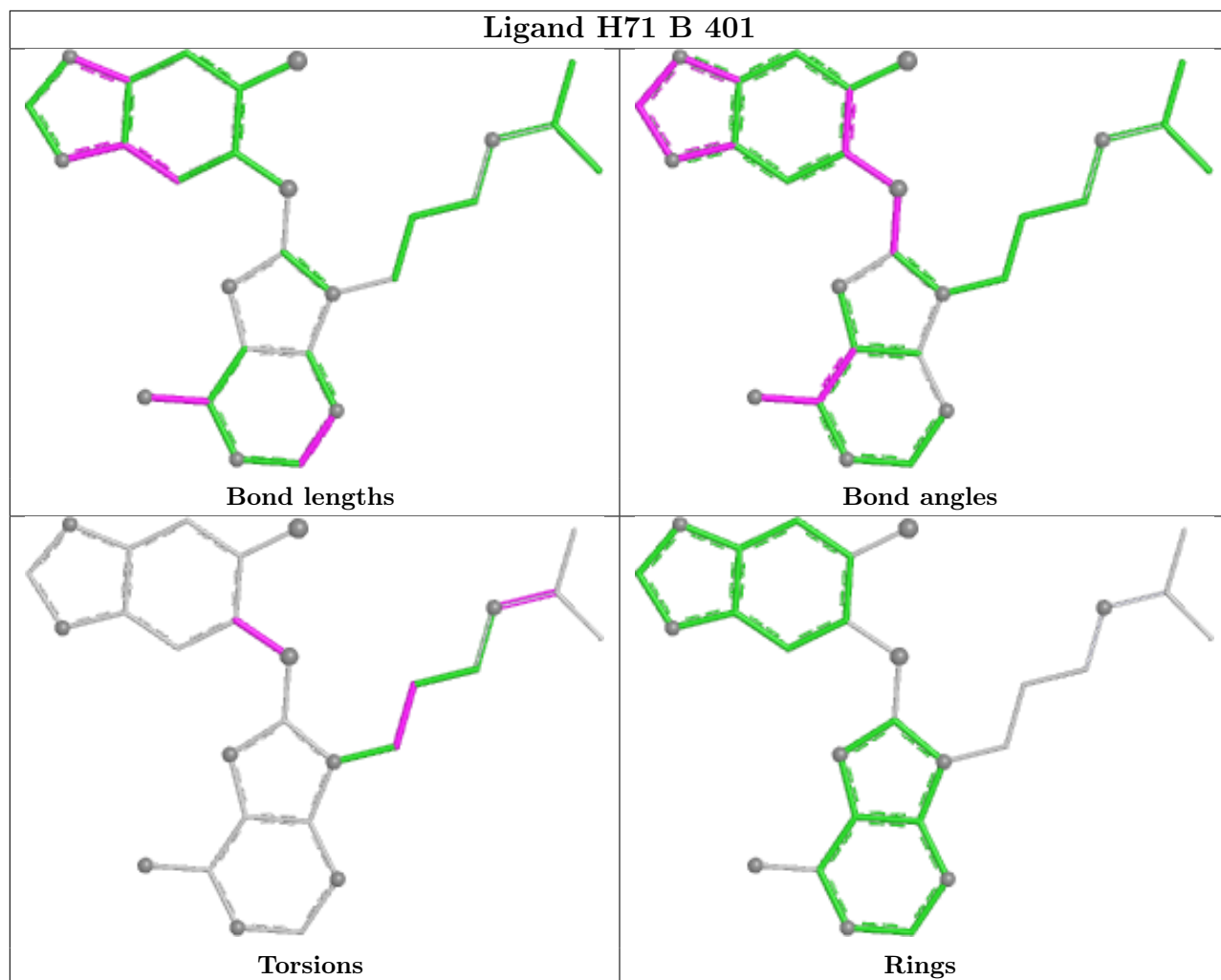
5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	H71	C96-C95-N94-C93
2	A	401	H71	N9-C91-C92-C93
2	B	401	H71	N9-C91-C92-C93
3	B	404	PG4	O3-C5-C6-O4
3	A	404	PG4	O2-C3-C4-O3

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	404	PG4	1	0
6	B	405	PEG	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 then 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 H71 B 401

Bond lengths

Bond angles

Torsions

Rings

Ligand H71 A 401

Bond lengths

Bond angles

Torsions

Rings
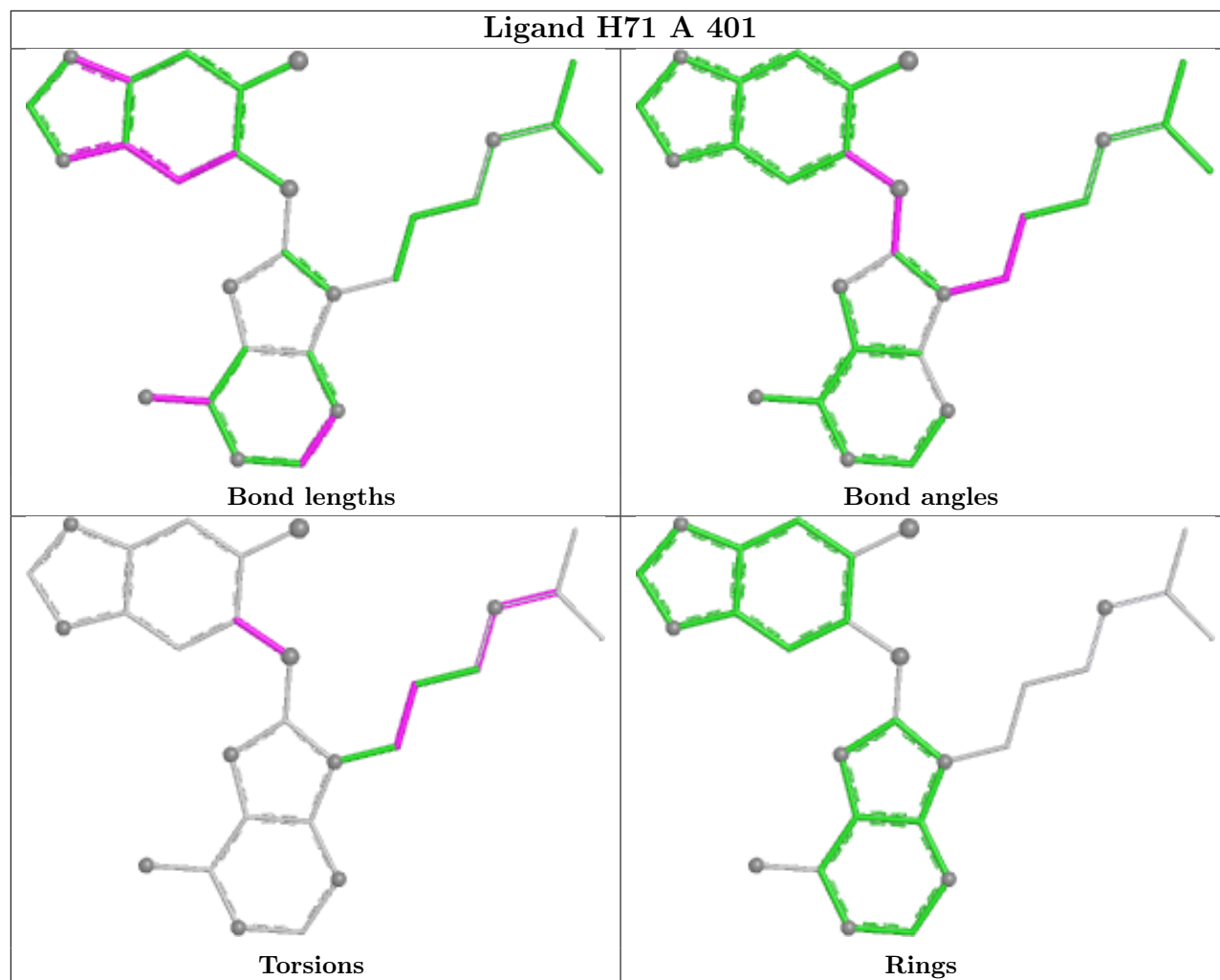
5.7 Other polymers ⓘ

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 failed to run properly - this section is therefore empty.

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

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS failed to run properly - this section is therefore empty.

6.4 Ligands ⓘ

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers ⓘ

EDS failed to run properly - this section is therefore empty.