Full wwPDB X-ray Structure Validation Report (i)

Sep 14, 2023 – 07:21 PM EDT

PDB ID	:	1MEN
Title	:	complex structure of human GAR Tfase and substrate beta-GAR
Authors	:	Zhang, Y.; Desharnais, J.; Greasley, S.E.; Beardsley, G.P.; Boger, D.L.; Wilson, I.A.
Deposited on	:	2002-08-08
Resolution	:	2.23 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 (i) 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 (1)) were used in the production of this report:

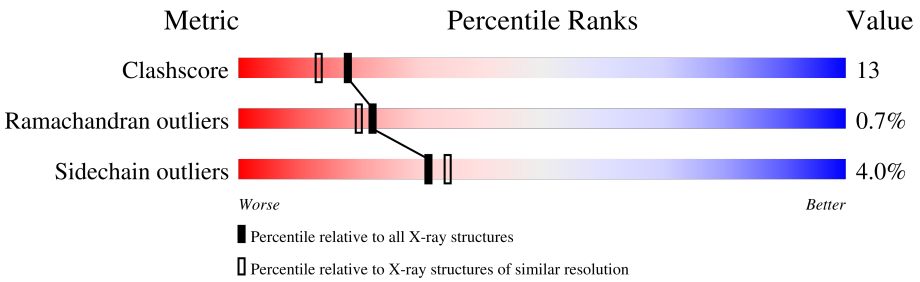
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.23 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	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)

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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	223	64% 24% • 10%
1	B	223	69% 20% • 10%
1	C	223	70% 18% • 10%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 4736 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 Phosphoribosylglycinamide formyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	201	1518	963	265	285	5	0	0	0
1	B	201	1518	963	265	285	5	0	0	0
1	C	201	1518	963	265	285	5	0	0	0

There are 66 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-10	ALA	-	expression tag	UNP P22102
A	-9	SER	-	expression tag	UNP P22102
A	-8	MET	-	expression tag	UNP P22102
A	-7	THR	-	expression tag	UNP P22102
A	-6	GLY	-	expression tag	UNP P22102
A	-5	GLY	-	expression tag	UNP P22102
A	-4	GLN	-	expression tag	UNP P22102
A	-3	GLN	-	expression tag	UNP P22102
A	-2	MET	-	expression tag	UNP P22102
A	-1	GLY	-	expression tag	UNP P22102
A	0	ARG	-	expression tag	UNP P22102
A	1	ILE	-	expression tag	UNP P22102
A	2	LEU	-	expression tag	UNP P22102
A	204	PRO	-	expression tag	UNP P22102
A	205	LEU	-	expression tag	UNP P22102
A	206	GLU	-	expression tag	UNP P22102
A	207	HIS	-	expression tag	UNP P22102
A	208	HIS	-	expression tag	UNP P22102
A	209	HIS	-	expression tag	UNP P22102
A	210	HIS	-	expression tag	UNP P22102
A	211	HIS	-	expression tag	UNP P22102
A	212	HIS	-	expression tag	UNP P22102
B	-10	ALA	-	expression tag	UNP P22102

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-9	SER	-	expression tag	UNP P22102
B	-8	MET	-	expression tag	UNP P22102
B	-7	THR	-	expression tag	UNP P22102
B	-6	GLY	-	expression tag	UNP P22102
B	-5	GLY	-	expression tag	UNP P22102
B	-4	GLN	-	expression tag	UNP P22102
B	-3	GLN	-	expression tag	UNP P22102
B	-2	MET	-	expression tag	UNP P22102
B	-1	GLY	-	expression tag	UNP P22102
B	0	ARG	-	expression tag	UNP P22102
B	1	ILE	-	expression tag	UNP P22102
B	2	LEU	-	expression tag	UNP P22102
B	204	PRO	-	expression tag	UNP P22102
B	205	LEU	-	expression tag	UNP P22102
B	206	GLU	-	expression tag	UNP P22102
B	207	HIS	-	expression tag	UNP P22102
B	208	HIS	-	expression tag	UNP P22102
B	209	HIS	-	expression tag	UNP P22102
B	210	HIS	-	expression tag	UNP P22102
B	211	HIS	-	expression tag	UNP P22102
B	212	HIS	-	expression tag	UNP P22102
C	-10	ALA	-	expression tag	UNP P22102
C	-9	SER	-	expression tag	UNP P22102
C	-8	MET	-	expression tag	UNP P22102
C	-7	THR	-	expression tag	UNP P22102
C	-6	GLY	-	expression tag	UNP P22102
C	-5	GLY	-	expression tag	UNP P22102
C	-4	GLN	-	expression tag	UNP P22102
C	-3	GLN	-	expression tag	UNP P22102
C	-2	MET	-	expression tag	UNP P22102
C	-1	GLY	-	expression tag	UNP P22102
C	0	ARG	-	expression tag	UNP P22102
C	1	ILE	-	expression tag	UNP P22102
C	2	LEU	-	expression tag	UNP P22102
C	204	PRO	-	expression tag	UNP P22102
C	205	LEU	-	expression tag	UNP P22102
C	206	GLU	-	expression tag	UNP P22102
C	207	HIS	-	expression tag	UNP P22102
C	208	HIS	-	expression tag	UNP P22102
C	209	HIS	-	expression tag	UNP P22102
C	210	HIS	-	expression tag	UNP P22102
C	211	HIS	-	expression tag	UNP P22102

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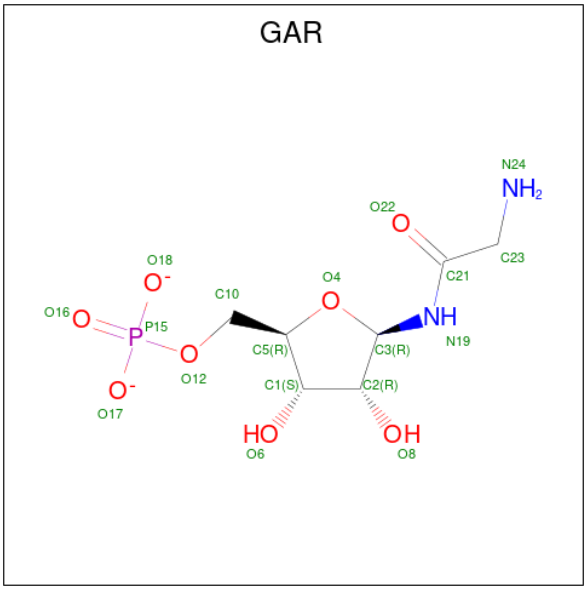
Chain	Residue	Modelled	Actual	Comment	Reference
C	212	HIS	-	expression tag	UNP P22102

- Molecule 2 is GLYCINAMIDE RIBONUCLEOTIDE (three-letter code: GAR) (formula: $C_7H_{13}N_2O_8P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			18	7	2	8	1		
2	B	1	Total	C	N	O	P	0	0
			18	7	2	8	1		
2	C	1	Total	C	N	O	P	0	0
			18	7	2	8	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	41	Total	O	0	0
			41	41		
3	B	49	Total	O	0	0
			49	49		
3	C	38	Total	O	0	0
			38	38		

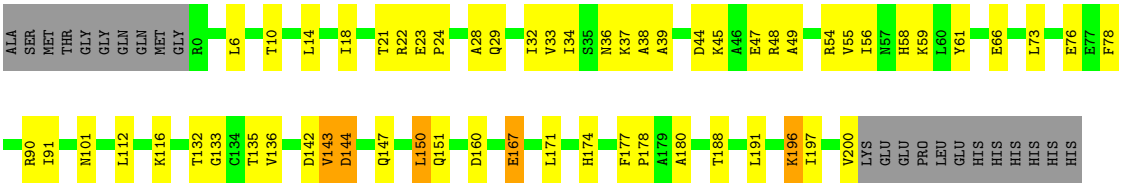
3 Residue-property plots (i)

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 was not executed.

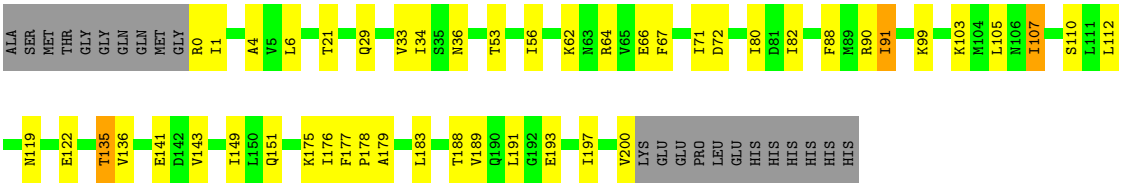
• Molecule 1: Phosphoribosylglycinamide formyltransferase

Chain A:



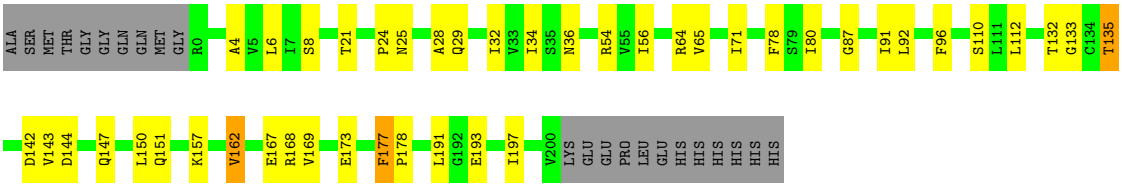
• Molecule 1: Phosphoribosylglycinamide formyltransferase

Chain B:



• Molecule 1: Phosphoribosylglycinamide formyltransferase

Chain C:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α, β, γ	147.82Å 147.82Å 188.04Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	35.28 – 2.23	Depositor
% Data completeness (in resolution range)	92.3 (35.28-2.23)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.220 , 0.266	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4736	wwPDB-VP
Average B, all atoms (Å^2)	43.0	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: GAR

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	0.42	0/1541	0.68	1/2091 (0.0%)
1	B	0.44	0/1541	0.67	0/2091
1	C	0.42	0/1541	0.69	0/2091
All	All	0.43	0/4623	0.68	1/6273 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	150	LEU	CA-CB-CG	5.25	127.38	115.30

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	1518	0	1565	51	0
1	B	1518	0	1565	39	0
1	C	1518	0	1565	39	0
2	A	18	0	13	0	0
2	B	18	0	13	0	0
2	C	18	0	13	0	0
3	A	41	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	49	0	0	2	0
3	C	38	0	0	1	0
All	All	4736	0	4734	126	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 13.

All (126) 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:135:THR:HB	1:C:151:GLN:HG2	1.36	1.06
1:A:147:GLN:HE21	1:A:197:ILE:H	1.12	0.95
1:B:91:ILE:H	1:B:91:ILE:HD13	1.30	0.95
1:B:135:THR:HB	1:B:151:GLN:HG2	1.48	0.94
1:A:147:GLN:HE21	1:A:197:ILE:N	1.79	0.79
1:C:24:PRO:O	1:C:25:ASN:HB2	1.81	0.79
1:A:59:LYS:HA	1:C:162:VAL:HG13	1.67	0.76
1:A:147:GLN:NE2	1:A:197:ILE:H	1.84	0.76
1:C:147:GLN:HB3	1:C:197:ILE:HG23	1.66	0.75
1:B:62:LYS:HB2	1:B:66:GLU:OE2	1.88	0.74
1:B:179:ALA:O	1:B:183:LEU:HD23	1.87	0.74
1:A:23:GLU:HG3	1:A:24:PRO:HD2	1.70	0.72
1:A:59:LYS:HA	1:C:162:VAL:CG1	2.22	0.70
1:B:112:LEU:H	1:B:135:THR:HG21	1.57	0.69
1:B:91:ILE:H	1:B:91:ILE:CD1	2.04	0.69
1:A:23:GLU:CG	1:A:24:PRO:HD2	2.22	0.68
1:B:0:ARG:HD3	1:B:29:GLN:HB2	1.75	0.68
1:B:1:ILE:HG21	1:B:82:ILE:HD12	1.74	0.68
1:C:157:LYS:HD2	1:C:168:ARG:NH2	2.09	0.67
1:C:112:LEU:H	1:C:135:THR:HG21	1.60	0.67
1:C:6:LEU:HD22	1:C:34:ILE:HB	1.76	0.67
1:A:21:THR:CG2	1:A:29:GLN:HA	2.27	0.64
1:B:6:LEU:HD22	1:B:34:ILE:HB	1.79	0.64
1:A:147:GLN:NE2	1:A:196:LYS:HA	2.14	0.63
1:A:32:ILE:HD13	1:A:78:PHE:CZ	2.35	0.61
1:C:142:ASP:O	1:C:144:ASP:N	2.34	0.60
1:A:91:ILE:N	1:A:91:ILE:HD12	2.16	0.60
1:A:61:TYR:HD2	1:A:66:GLU:HG2	1.66	0.60
1:A:188:THR:HA	1:A:200:VAL:HG23	1.82	0.60
1:A:91:ILE:HD12	1:A:91:ILE:H	1.65	0.59
1:C:110:SER:O	1:C:135:THR:CG2	2.52	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:21:THR:HG23	1:A:29:GLN:HA	1.86	0.58
1:C:147:GLN:HB3	1:C:197:ILE:CG2	2.33	0.58
1:B:91:ILE:HD13	1:B:91:ILE:N	2.10	0.57
1:C:142:ASP:C	1:C:144:ASP:H	2.08	0.56
1:B:107:ILE:HD12	1:B:136:VAL:HG22	1.86	0.56
1:C:135:THR:HG21	1:C:151:GLN:HE21	1.71	0.56
1:B:88:PHE:CE2	1:B:90:ARG:HB2	2.41	0.56
1:B:110:SER:O	1:B:135:THR:HG23	2.06	0.56
1:C:36:ASN:HD22	1:C:36:ASN:H	1.53	0.56
1:C:64:ARG:HG3	3:C:248:HOH:O	2.05	0.56
1:A:54:ARG:HH11	1:A:54:ARG:HG3	1.71	0.56
1:A:44:ASP:O	1:A:48:ARG:HG3	2.06	0.55
1:A:22:ARG:HH11	1:A:22:ARG:HG3	1.71	0.54
1:B:110:SER:O	1:B:135:THR:CG2	2.56	0.53
1:C:193:GLU:HA	1:C:193:GLU:OE1	2.09	0.52
1:A:36:ASN:HA	1:A:56:ILE:O	2.10	0.52
3:A:238:HOH:O	1:C:65:VAL:HG23	2.09	0.52
1:A:6:LEU:HD22	1:A:34:ILE:HB	1.90	0.52
1:C:177:PHE:HB3	1:C:178:PRO:HD3	1.92	0.52
1:C:110:SER:O	1:C:135:THR:HG23	2.10	0.51
1:B:200:VAL:O	1:B:200:VAL:HG13	2.08	0.51
1:A:32:ILE:HG13	1:A:33:VAL:N	2.24	0.51
1:A:132:THR:HG23	1:A:133:GLY:N	2.25	0.51
1:A:10:THR:O	1:A:45:LYS:HE2	2.11	0.51
1:A:21:THR:HG21	1:A:29:GLN:HA	1.93	0.50
1:C:4:ALA:HB2	1:C:80:ILE:HG13	1.92	0.50
1:A:101:ASN:ND2	3:A:226:HOH:O	2.44	0.50
1:B:36:ASN:HA	1:B:56:ILE:O	2.11	0.50
1:A:47:GLU:C	1:A:49:ALA:H	2.15	0.50
1:B:33:VAL:HB	1:B:53:THR:HG22	1.94	0.49
1:B:4:ALA:HB2	1:B:80:ILE:HG13	1.95	0.49
1:A:58:HIS:CD2	1:A:90:ARG:NH2	2.81	0.49
1:C:135:THR:CG2	1:C:151:GLN:HE21	2.26	0.49
1:A:142:ASP:C	1:A:144:ASP:H	2.15	0.48
1:B:64:ARG:HB2	1:B:64:ARG:NH1	2.28	0.48
1:C:56:ILE:HD12	1:C:71:ILE:HD13	1.96	0.48
1:B:135:THR:CB	1:B:151:GLN:HG2	2.33	0.47
1:B:188:THR:O	1:B:200:VAL:HG12	2.13	0.47
1:B:91:ILE:O	1:B:91:ILE:HG12	2.14	0.47
1:B:193:GLU:HA	1:B:193:GLU:OE1	2.14	0.47
1:C:132:THR:HG23	1:C:133:GLY:N	2.29	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:92:LEU:HD22	1:C:96:PHE:CD1	2.50	0.47
1:B:67:PHE:CZ	1:B:71:ILE:HD11	2.49	0.47
1:B:135:THR:HB	1:B:151:GLN:CG	2.32	0.47
1:A:135:THR:HG23	1:A:151:GLN:HG2	1.97	0.47
1:C:36:ASN:H	1:C:36:ASN:ND2	2.13	0.46
1:C:64:ARG:HD3	1:C:91:ILE:O	2.14	0.46
1:C:197:ILE:HD12	1:C:197:ILE:C	2.35	0.46
1:A:21:THR:HG23	1:A:28:ALA:O	2.15	0.46
1:A:174:HIS:O	1:A:178:PRO:HG2	2.16	0.46
1:A:23:GLU:CD	1:A:24:PRO:HD2	2.36	0.46
1:A:59:LYS:CA	1:C:162:VAL:HG13	2.42	0.46
1:B:175:LYS:O	1:B:178:PRO:HD2	2.16	0.46
1:A:73:LEU:HD23	1:A:73:LEU:HA	1.84	0.46
1:B:136:VAL:HG23	1:B:176:ILE:HD12	1.98	0.46
1:A:23:GLU:OE2	1:A:24:PRO:HD2	2.16	0.46
1:C:21:THR:HG23	1:C:28:ALA:O	2.16	0.46
1:A:136:VAL:HG11	1:A:180:ALA:HB2	1.98	0.45
1:B:119:ASN:HB3	1:B:122:GLU:HG3	1.98	0.45
1:B:197:ILE:HG21	3:B:266:HOH:O	2.15	0.45
1:A:116:LYS:HE2	1:A:144:ASP:CG	2.37	0.45
1:B:112:LEU:H	1:B:135:THR:CG2	2.26	0.45
1:A:37:LYS:HE2	3:A:251:HOH:O	2.16	0.45
1:B:188:THR:HA	1:B:200:VAL:HG12	1.99	0.45
1:B:188:THR:HA	1:B:200:VAL:CG1	2.47	0.44
1:C:6:LEU:N	1:C:6:LEU:HD23	2.32	0.44
1:B:183:LEU:HD12	1:B:189:VAL:HG23	1.98	0.44
1:A:22:ARG:HG3	1:A:22:ARG:NH1	2.32	0.44
1:C:54:ARG:HA	1:C:54:ARG:HD3	1.74	0.44
1:C:21:THR:CG2	1:C:29:GLN:HA	2.48	0.43
1:A:47:GLU:C	1:A:49:ALA:N	2.71	0.43
1:A:143:VAL:O	1:A:143:VAL:HG12	2.18	0.43
1:B:90:ARG:NH1	3:B:251:HOH:O	2.51	0.43
1:B:105:LEU:HD22	1:B:149:ILE:CD1	2.48	0.43
1:C:32:ILE:HD13	1:C:78:PHE:CZ	2.53	0.43
1:C:169:VAL:O	1:C:173:GLU:HG3	2.19	0.43
1:A:167:GLU:OE1	1:A:167:GLU:HA	2.18	0.43
1:A:191:LEU:HD23	1:A:191:LEU:HA	1.84	0.42
1:A:14:LEU:O	1:A:18:ILE:HG13	2.19	0.42
1:A:38:ALA:O	1:A:39:ALA:HB3	2.20	0.42
1:A:58:HIS:CD2	1:A:90:ARG:CZ	3.03	0.42
1:A:142:ASP:O	1:A:144:ASP:N	2.53	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1:ILE:N	1:B:1:ILE:HD13	2.35	0.41
1:C:36:ASN:HA	1:C:56:ILE:O	2.20	0.41
1:C:142:ASP:C	1:C:144:ASP:N	2.74	0.41
1:B:135:THR:HG21	1:B:151:GLN:HE21	1.84	0.41
1:C:112:LEU:H	1:C:135:THR:CG2	2.30	0.41
1:C:191:LEU:HD23	1:C:191:LEU:HA	1.83	0.41
1:B:72:ASP:OD2	1:B:99:LYS:HE3	2.20	0.41
1:A:22:ARG:HH22	1:A:49:ALA:HB1	1.86	0.41
1:C:8:SER:HB2	1:C:87:GLY:O	2.20	0.41
1:A:18:ILE:O	1:A:22:ARG:HG2	2.21	0.41
1:B:64:ARG:HB2	1:B:64:ARG:HH11	1.85	0.41
1:A:38:ALA:HB2	1:A:55:VAL:HG11	2.03	0.40
1:A:76:GLU:HA	1:A:76:GLU:OE1	2.22	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	199/223 (89%)	189 (95%)	8 (4%)	2 (1%)	15	11
1	B	199/223 (89%)	192 (96%)	6 (3%)	1 (0%)	29	28
1	C	199/223 (89%)	191 (96%)	7 (4%)	1 (0%)	29	28
All	All	597/669 (89%)	572 (96%)	21 (4%)	4 (1%)	22	20

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	143	VAL
1	A	143	VAL
1	A	160	ASP
1	B	143	VAL

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	166/184 (90%)	159 (96%)	7 (4%)	30	32
1	B	166/184 (90%)	158 (95%)	8 (5%)	25	25
1	C	166/184 (90%)	161 (97%)	5 (3%)	41	47
All	All	498/552 (90%)	478 (96%)	20 (4%)	31	34

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	LEU
1	A	144	ASP
1	A	150	LEU
1	A	167	GLU
1	A	171	LEU
1	A	177	PHE
1	A	196	LYS
1	B	21	THR
1	B	91	ILE
1	B	103	LYS
1	B	107	ILE
1	B	135	THR
1	B	141	GLU
1	B	177	PHE
1	B	191	LEU
1	C	135	THR
1	C	150	LEU
1	C	162	VAL
1	C	167	GLU
1	C	177	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	25	ASN

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Mol	Chain	Res	Type
1	A	101	ASN
1	A	119	ASN
1	A	121	HIS
1	A	147	GLN
1	B	151	GLN
1	C	36	ASN
1	C	151	GLN

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

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	GAR	C	225	-	17,18,18	1.28	2 (11%)	21,26,26	1.25	4 (19%)
2	GAR	A	223	-	17,18,18	1.32	2 (11%)	21,26,26	1.27	3 (14%)
2	GAR	B	224	-	17,18,18	1.36	4 (23%)	21,26,26	1.40	3 (14%)

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	GAR	C	225	-	-	6/12/28/28	0/1/1/1
2	GAR	A	223	-	-	6/12/28/28	0/1/1/1
2	GAR	B	224	-	-	6/12/28/28	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	223	GAR	P15-O18	-3.17	1.42	1.54
2	C	225	GAR	P15-O18	-2.93	1.43	1.54
2	B	224	GAR	P15-O18	-2.75	1.44	1.54
2	B	224	GAR	P15-O16	2.57	1.58	1.50
2	A	223	GAR	P15-O16	2.42	1.58	1.50
2	C	225	GAR	P15-O16	2.23	1.57	1.50
2	B	224	GAR	C2-C3	-2.12	1.46	1.53
2	B	224	GAR	P15-O12	-2.06	1.53	1.60

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	224	GAR	O12-P15-O16	-3.35	97.08	106.47
2	B	224	GAR	P15-O12-C10	3.33	127.46	118.30
2	A	223	GAR	P15-O12-C10	2.87	126.19	118.30
2	A	223	GAR	O12-P15-O16	-2.82	98.57	106.47
2	A	223	GAR	O18-P15-O12	2.82	114.22	106.73
2	C	225	GAR	P15-O12-C10	2.81	126.02	118.30
2	C	225	GAR	O12-P15-O16	-2.75	98.76	106.47
2	B	224	GAR	O18-P15-O12	2.66	113.82	106.73
2	C	225	GAR	C3-N19-C21	2.20	126.33	122.45
2	C	225	GAR	O18-P15-O12	2.11	112.36	106.73

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	223	GAR	C10-O12-P15-O17
2	A	223	GAR	C10-O12-P15-O18
2	B	224	GAR	C10-O12-P15-O17
2	B	224	GAR	C10-O12-P15-O18
2	C	225	GAR	C10-O12-P15-O16

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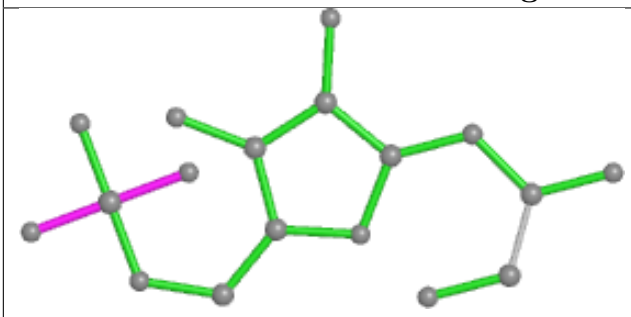
Mol	Chain	Res	Type	Atoms
2	C	225	GAR	C10-O12-P15-O17
2	C	225	GAR	C10-O12-P15-O18
2	A	223	GAR	C10-O12-P15-O16
2	B	224	GAR	C10-O12-P15-O16
2	A	223	GAR	O22-C21-C23-N24
2	B	224	GAR	O22-C21-C23-N24
2	C	225	GAR	O22-C21-C23-N24
2	A	223	GAR	O12-C10-C5-O4
2	B	224	GAR	O12-C10-C5-O4
2	A	223	GAR	N19-C21-C23-N24
2	B	224	GAR	N19-C21-C23-N24
2	C	225	GAR	N19-C21-C23-N24
2	C	225	GAR	O12-C10-C5-O4

There are no ring outliers.

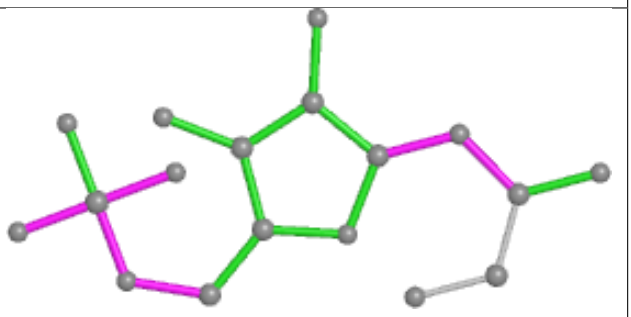
No monomer is involved in short contacts.

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 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.

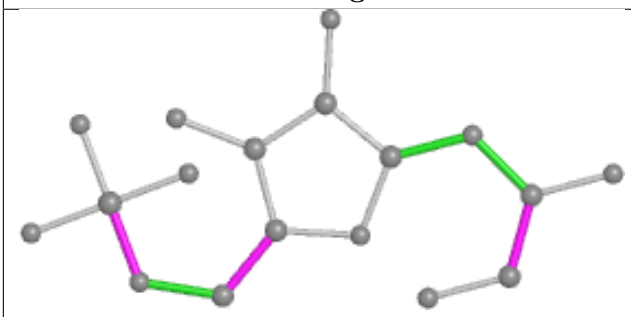
Ligand GAR C 225



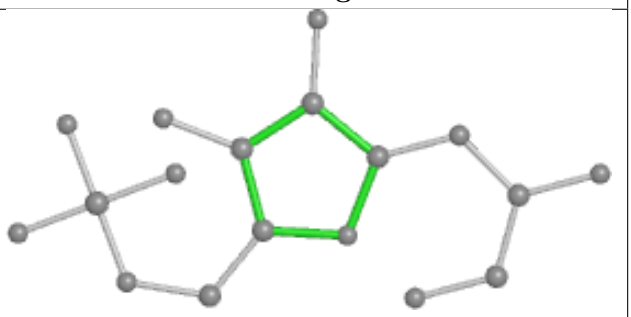
Bond lengths



Bond angles

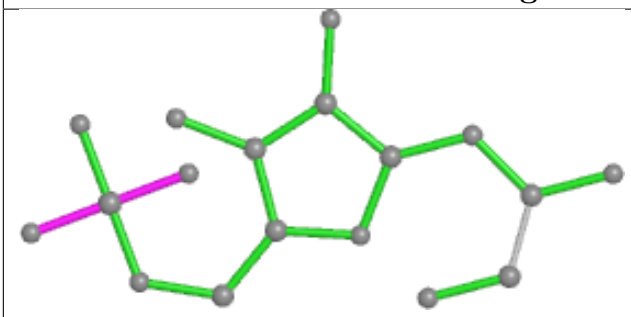


Torsions

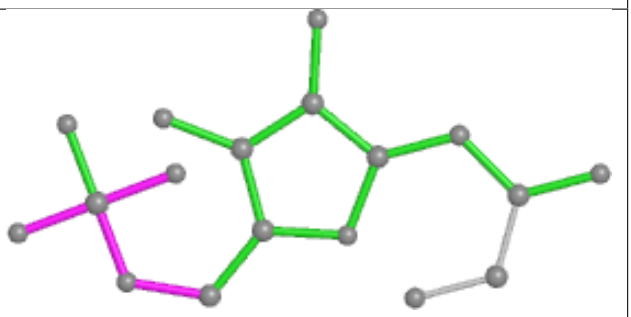


Rings

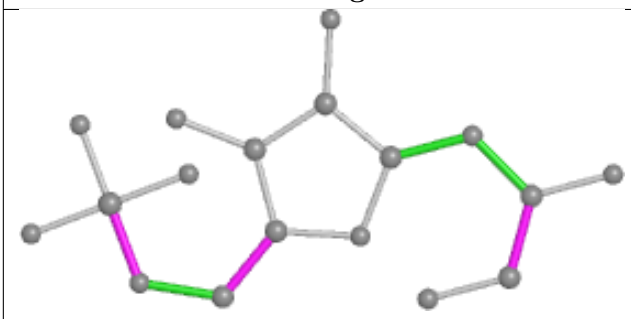
Ligand GAR A 223



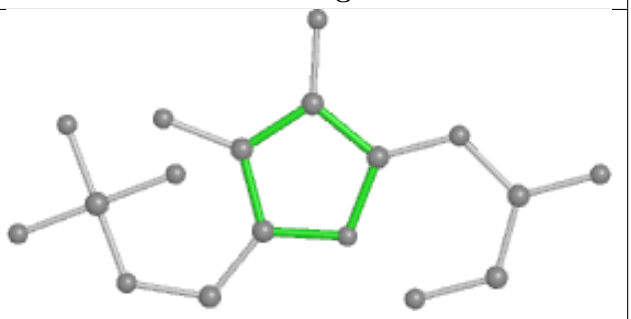
Bond lengths



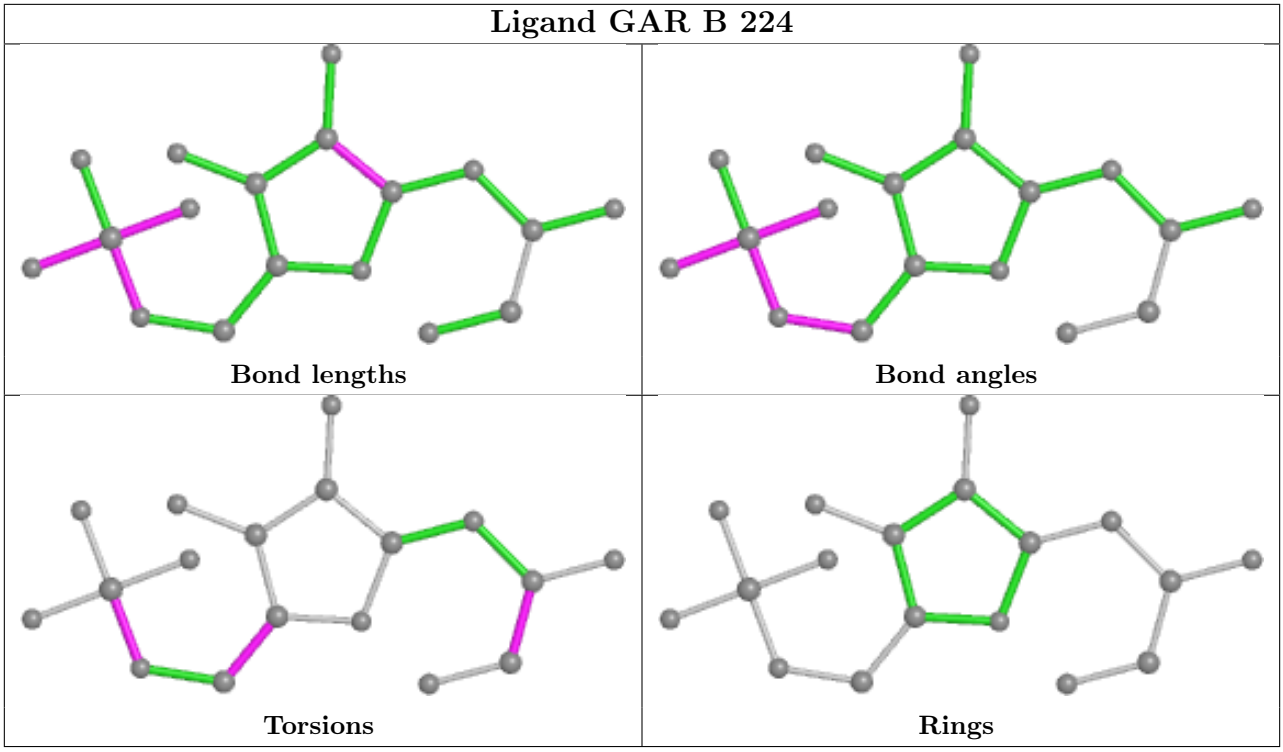
Bond angles



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 (i)

6.1 Protein, DNA and RNA chains (i)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.