W O R L D W I D E
wwPDB
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Full wwPDB NMR Structure Validation Report ⓘ

Oct 12, 2021 – 04:32 PM EDT

PDB ID   :   1YCM
Title   :   Solution Structure of matrix metalloproteinase 12 (MMP12) in the presence of N-Isobutyl-N-[4-methoxyphenylsulfonyl]glycyl hydroxamic acid (NNGH)
Authors   :   Bertini, I.; Calderone, V.; Cosenza, M.; Fragai, M.; Lee, Y.M.; Luchinat, C.; Mangani, S.; Terni, B.; Turano, P.; Structural Proteomics in Europe (SPINE)
Deposited on   :   2004-12-22

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

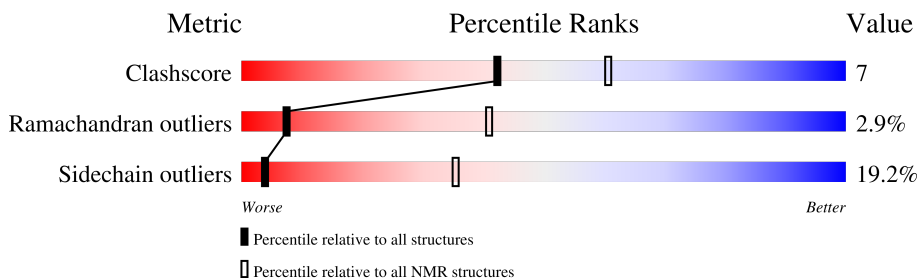|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	2.23.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

1   Overall quality at a glance   ⓘ

The following experimental techniques were used to determine the structure:
SOLUTION NMR

The overall completeness of chemical shifts assignment was not calculated.

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		7
Ramachandran outliers		2.9%
Sidechain outliers		19.2%

Worse   *Better*

∎ Percentile relative to all structures

▯ Percentile relative to all NMR structures

Metric	Whole archive (#Entries)	NMR archive (#Entries)
Clashscore	158937	12864
Ramachandran outliers	154571	11451
Sidechain outliers	154315	11428

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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%

Mol	Chain	Length	Quality of chain
1	A	159	72% 19% • 8%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA and RNA chains that are outliers for geometric criteria:

Mol	Chain	Compound	Res	Total models with violations	
				Chirality	Geometry
4	A	NGH	269	9	3

2 Ensemble composition and analysis ⓘ

This entry contains 20 models. Model 2 is the overall representative, medoid model (most similar to other models). The authors have identified model 20 as representative, based on the following criterion: *lowest energy*.

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	**Residue range (total)**	**Backbone RMSD (Å)**	**Medoid model**
1	A:111-A:168, A:173-A:261 (147)	0.53	2

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 3 clusters and 7 single-model clusters were found.

Cluster number	Models
1	2, 3, 5, 6, 8, 12, 13, 18, 19
2	7, 9
3	1, 4
Single-model clusters	10; 11; 14; 15; 16; 17; 20

3 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 2467 atoms, of which 1196 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Macrophage metalloelastase.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	159	2422	794	1177	217	230	4	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	105	MET	-	initiating methionine	UNP P39900
A	171	ASP	PHE	engineered mutation	UNP P39900

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	
			Total	Zn
2	A	2	2	2

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	
			Total	Ca
3	A	3	3	3

- Molecule 4 is N-ISOBUTYL-N-[4-METHOXYPHENYLSULFONYL]GLYCYL HYDROX-AMIC ACID (three-letter code: NGH) (formula: $C_{13}H_{20}N_2O_5S$).

NGH

C13

C12

C9

O2

C14

C5

S1 N(R) C10

C4

C6

C7

C3 C1

O5 O3

O1 C2

C11

N1

NH

OH

O4
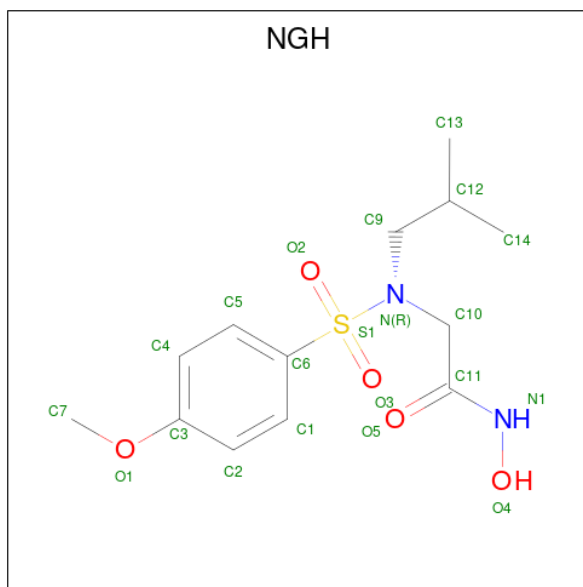
Mol	Chain	Residues	Atoms					
			Total	C	H	N	O	S
4	A	1	40	13	19	2	5	1

4 Residue-property plots (i)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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 outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.
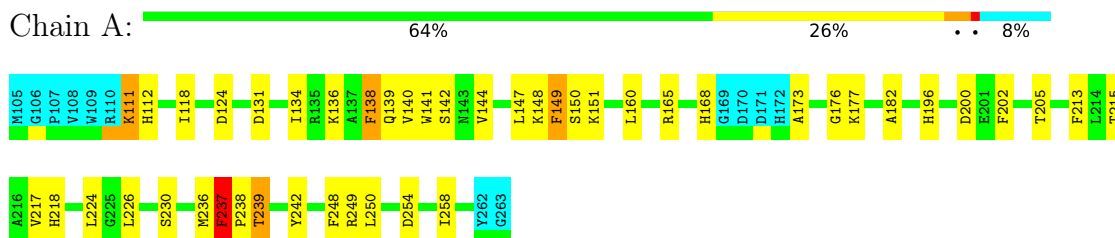
- Molecule 1: Macrophage metalloelastase
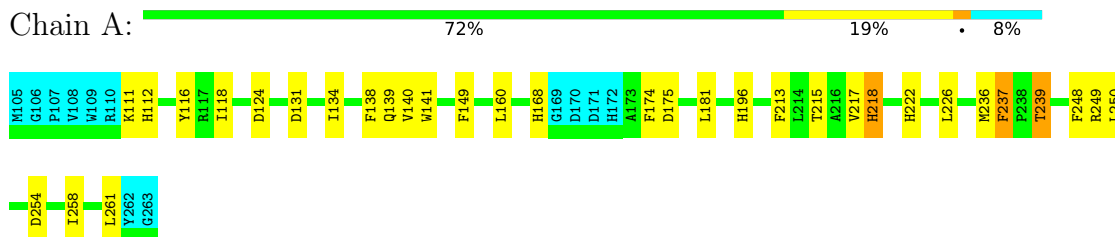
4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

- Molecule 1: Macrophage metalloelastase

4.2.2 Score per residue for model 2 (medoid)

- Molecule 1: Macrophage metalloelastase

4.2.3 Score per residue for model 3

• Molecule 1: Macrophage metalloelastase
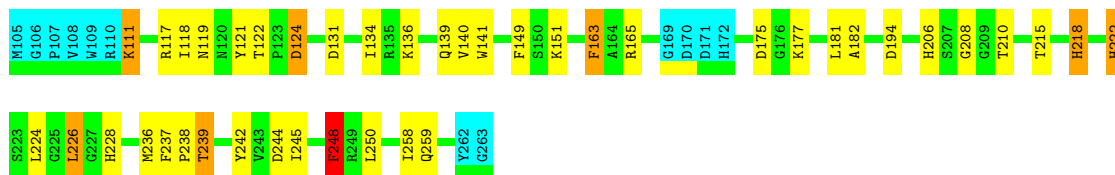

4.2.4 Score per residue for model 4

• Molecule 1: Macrophage metalloelastase

4.2.5 Score per residue for model 5

• Molecule 1: Macrophage metalloelastase

4.2.6 Score per residue for model 6

• Molecule 1: Macrophage metalloelastase

Chain A:

4.2.7 Score per residue for model 7

• Molecule 1: Macrophage metalloelastase

Chain A:

4.2.8 Score per residue for model 8

• Molecule 1: Macrophage metalloelastase

Chain A:

4.2.9 Score per residue for model 9

• Molecule 1: Macrophage metalloelastase

Chain A:
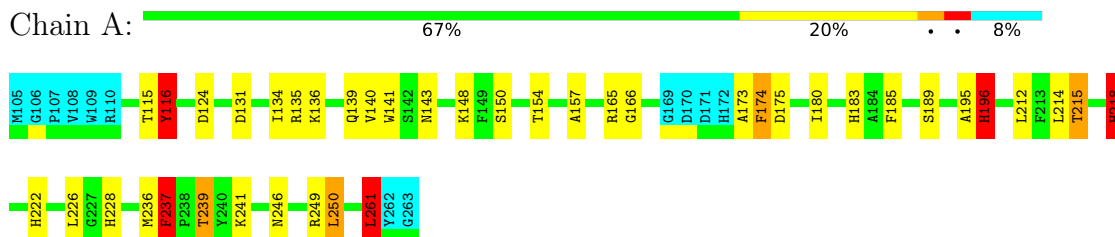
4.2.10　Score per residue for model 10

• Molecule 1: Macrophage metalloelastase

Chain A:
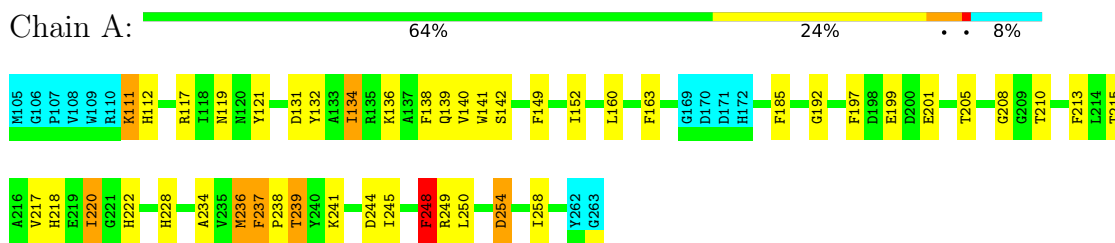
4.2.11　Score per residue for model 11

• Molecule 1: Macrophage metalloelastase

Chain A:
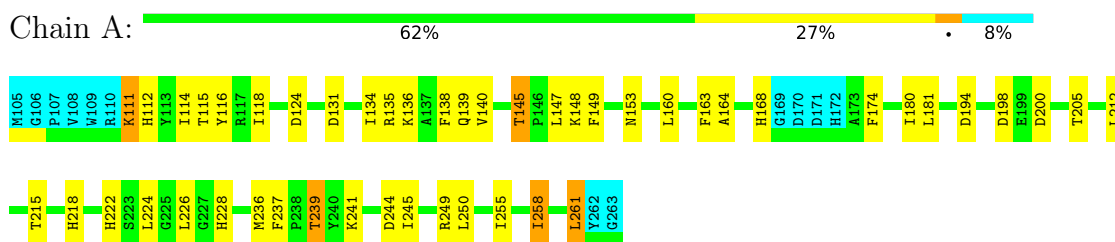
4.2.12　Score per residue for model 12

• Molecule 1: Macrophage metalloelastase

Chain A:
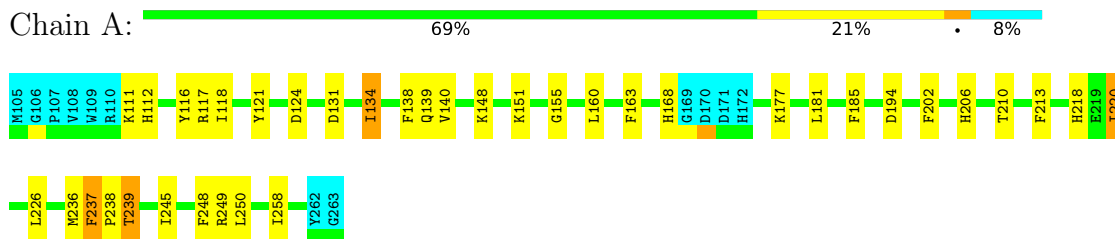
4.2.13　Score per residue for model 13

• Molecule 1: Macrophage metalloelastase

Chain A:
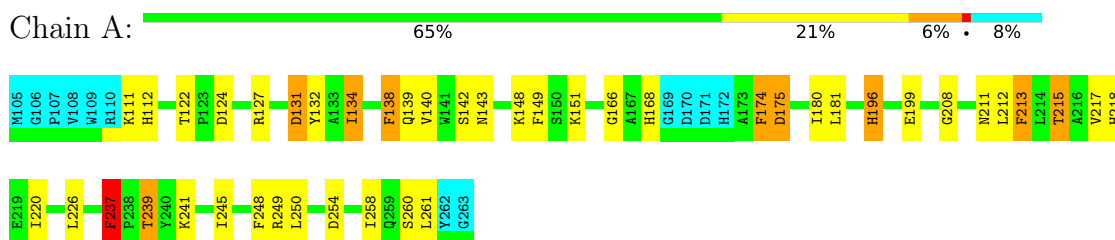
4.2.14 Score per residue for model 14

• Molecule 1: Macrophage metalloelastase
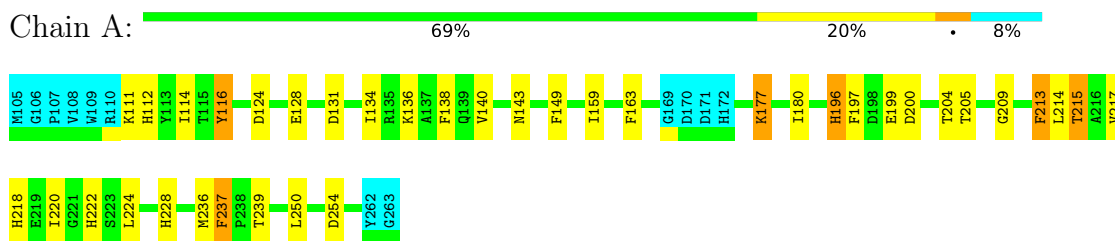
4.2.15 Score per residue for model 15
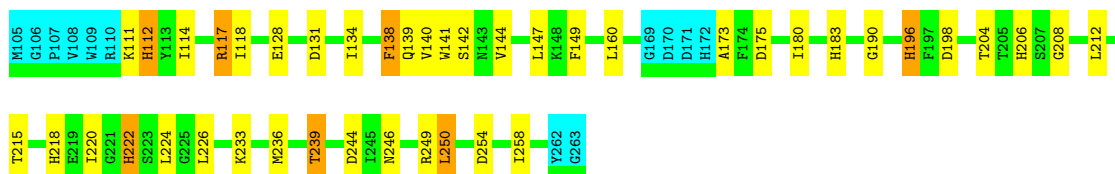
• Molecule 1: Macrophage metalloelastase
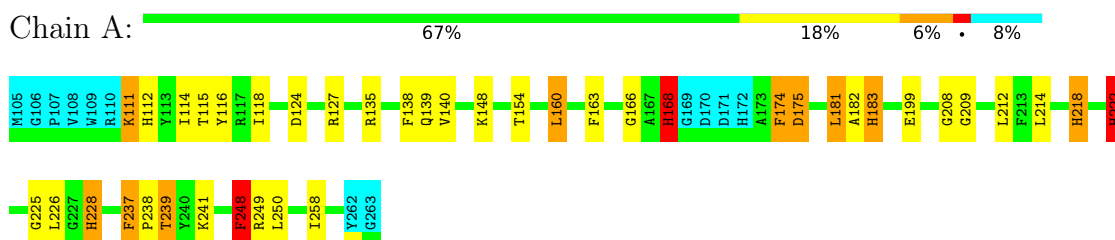
4.2.16 Score per residue for model 16

• Molecule 1: Macrophage metalloelastase
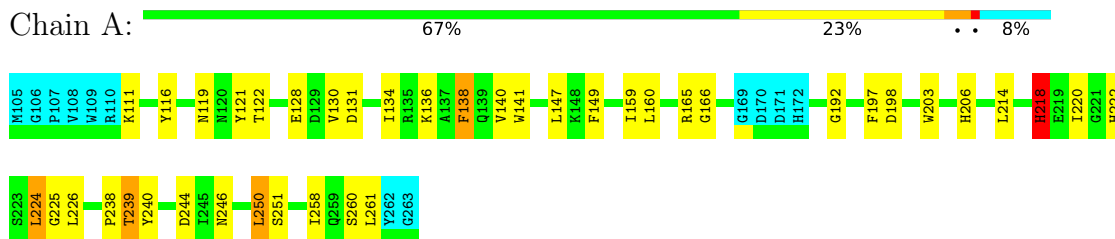
4.2.17 Score per residue for model 17

• Molecule 1: Macrophage metalloelastase
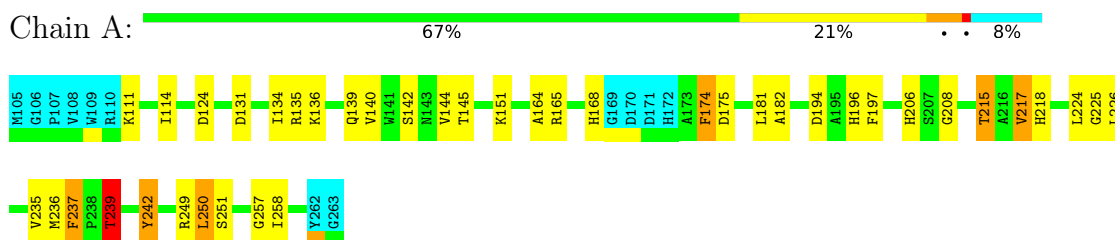
4.2.18 Score per residue for model 18

• Molecule 1: Macrophage metalloelastase

Chain A:
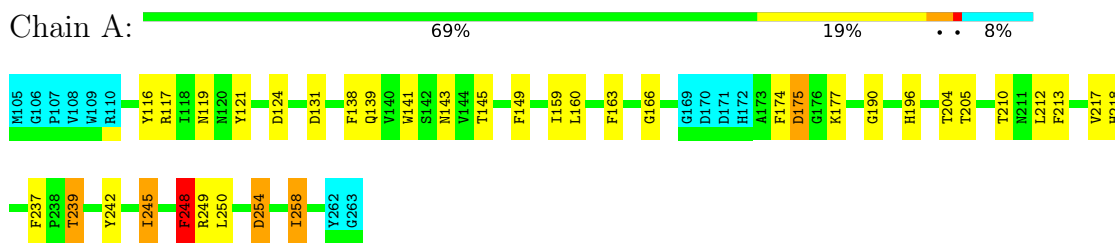
4.2.19 Score per residue for model 19
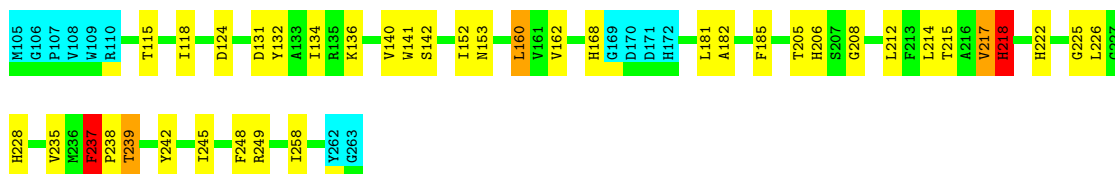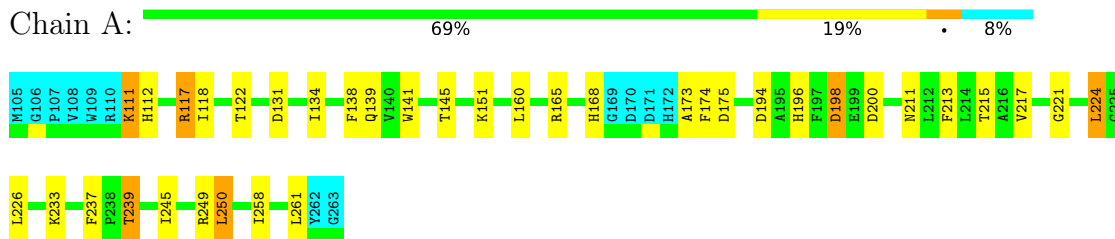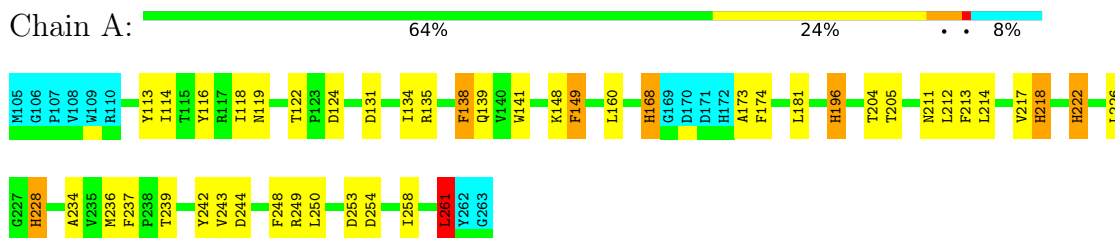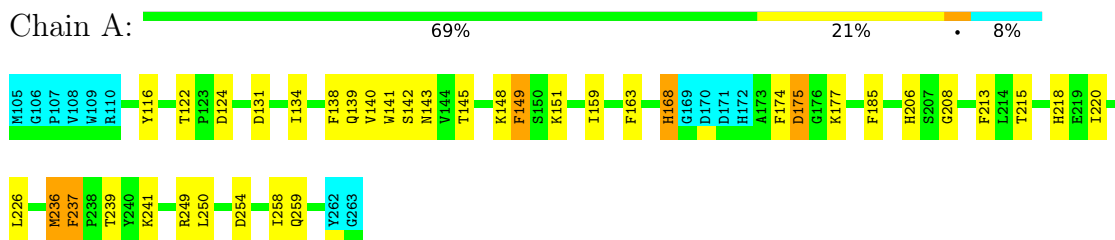
• Molecule 1: Macrophage metalloelastase

Chain A:
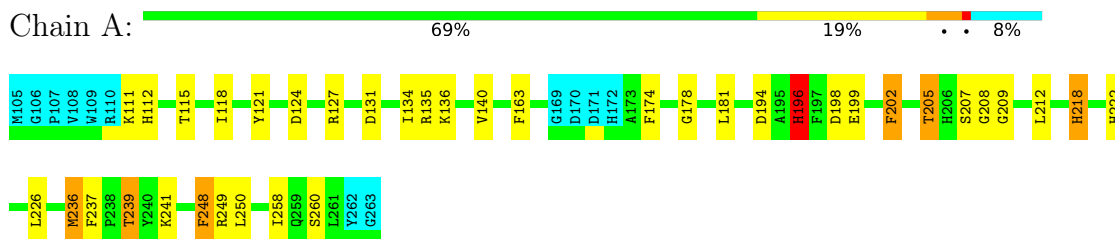
4.2.20 Score per residue for model 20

• Molecule 1: Macrophage metalloelastase

Chain A:
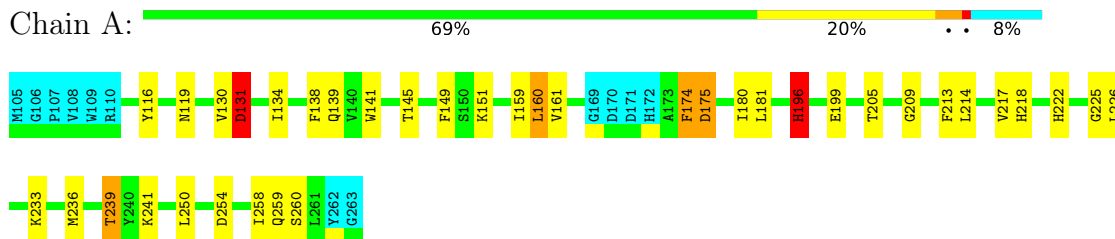
5 Refinement protocol and experimental data overview ⓘ

The models were refined using the following method: *distance geometry, simulated annealing, torsion angle dynamics, residue dipolar couplings.*

Of the 200 calculated structures, 20 were deposited, based on the following criterion: *structures with the lowest energy.*

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
DYANA	structure solution	1.5
Amber	refinement	6.0

No chemical shift data was provided.

6 Model quality ⓘ

6.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, NGH, CA

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 (average) 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	0.63±0.02	0±0/1181 (0.0± 0.0%)	1.06±0.05	4±2/1602 (0.2± 0.1%)
All	All	0.63	4/23620 (0.0%)	1.06	79/32040 (0.2%)

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	Planarity
1	A	0.0±0.0	3.2±1.4
All	All	0	64

All unique bond outliers are listed below.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	218	HIS	CB-CG	6.07	1.60	1.50	16	4

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	181	LEU	CB-CA-C	9.97	129.15	110.20	15	2
1	A	218	HIS	N-CA-CB	9.77	128.19	110.60	5	4
1	A	180	ILE	CA-CB-CG2	9.75	130.39	110.90	3	1
1	A	196	HIS	CA-CB-CG	8.03	127.26	113.60	4	5
1	A	180	ILE	CB-CA-C	7.92	127.44	111.60	3	2
1	A	218	HIS	CB-CA-C	-7.73	94.94	110.40	3	3
1	A	180	ILE	N-CA-CB	-7.60	93.32	110.80	3	1
1	A	127	ARG	NE-CZ-NH2	-7.41	116.60	120.30	15	1

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})	Models Worst	Total
1	A	196	HIS	N-CA-CB	6.59	122.46	110.60	4	2
1	A	162	VAL	CA-CB-CG1	6.58	120.76	110.90	5	1
1	A	215	THR	N-CA-CB	-6.55	97.85	110.30	14	7
1	A	222	HIS	CA-CB-CG	6.52	124.69	113.60	4	1
1	A	239	THR	N-CA-CB	-6.45	98.05	110.30	19	16
1	A	160	LEU	CB-CA-C	6.12	121.82	110.20	3	3
1	A	124	ASP	CB-CG-OD1	6.07	123.76	118.30	5	6
1	A	199	GLU	OE1-CD-OE2	-5.79	116.36	123.30	20	4
1	A	183	HIS	N-CA-CB	5.76	120.97	110.60	15	1
1	A	116	TYR	CB-CG-CD1	-5.76	117.55	121.00	9	1
1	A	237	PHE	CB-CG-CD2	-5.59	116.89	120.80	5	6
1	A	261	LEU	CB-CA-C	5.59	120.82	110.20	9	2
1	A	198	ASP	CB-CG-OD2	-5.42	113.42	118.30	16	2
1	A	205	THR	CA-CB-CG2	5.33	119.86	112.40	19	2
1	A	200	ASP	CB-CG-OD2	-5.29	113.54	118.30	3	1
1	A	145	THR	CA-CB-CG2	5.29	119.80	112.40	11	1
1	A	117	ARG	NE-CZ-NH2	-5.21	117.69	120.30	18	1
1	A	131	ASP	CA-CB-CG	5.20	124.84	113.40	20	1
1	A	214	LEU	CB-CG-CD1	-5.07	102.38	111.00	20	2

There are no chirality outliers.

All unique planar outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	121	TYR	Sidechain	6
1	A	174	PHE	Sidechain,Peptide	6
1	A	196	HIS	Sidechain	6
1	A	116	TYR	Sidechain	6
1	A	242	TYR	Sidechain	5
1	A	248	PHE	Sidechain	5
1	A	163	PHE	Sidechain	4
1	A	132	TYR	Sidechain	3
1	A	194	ASP	Sidechain	3
1	A	213	PHE	Sidechain	3
1	A	202	PHE	Sidechain	2
1	A	149	PHE	Sidechain	2
1	A	117	ARG	Sidechain	2
1	A	218	HIS	Sidechain	2
1	A	197	PHE	Sidechain	2
1	A	113	TYR	Sidechain	1

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Mol	Chain	Res	Type	Group	Models (Total)
1	A	195	ALA	Peptide	1
1	A	168	HIS	Sidechain	1
1	A	222	HIS	Sidechain	1
1	A	240	TYR	Sidechain	1
1	A	124	ASP	Sidechain	1
1	A	127	ARG	Sidechain	1

6.2   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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	1148	1096	1096	16±7
4	A	21	19	19	5±7
All	All	23480	22300	22302	330

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 7.

All unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models Worst	Models Total
1:A:182:ALA:H	4:A:269:NGH:H102	0.91	1.26	5	2
1:A:145:THR:HG22	1:A:258:ILE:HD13	0.90	1.42	18	4
1:A:182:ALA:H	4:A:269:NGH:C13	0.90	1.78	3	1
1:A:182:ALA:O	4:A:269:NGH:H102	0.89	1.67	17	2
1:A:226:LEU:HD11	1:A:258:ILE:HG22	0.88	1.44	3	6
1:A:141:TRP:CZ3	1:A:258:ILE:HG21	0.86	2.05	8	12
1:A:226:LEU:HD21	1:A:258:ILE:HG22	0.81	1.51	4	1
1:A:182:ALA:O	4:A:269:NGH:H131	0.81	1.76	3	1
1:A:218:HIS:HD1	4:A:269:NGH:H72	0.79	1.35	9	2
1:A:182:ALA:H	4:A:269:NGH:C10	0.79	1.89	5	1
1:A:215:THR:HG23	4:A:269:NGH:H2	0.75	1.58	9	3
1:A:147:LEU:HD13	1:A:224:LEU:HD22	0.75	1.57	1	1
1:A:182:ALA:N	4:A:269:NGH:C13	0.74	2.50	3	1
1:A:181:LEU:H	4:A:269:NGH:H91	0.73	1.43	3	1
1:A:218:HIS:CD2	4:A:269:NGH:O4	0.72	2.42	9	7
1:A:182:ALA:H	4:A:269:NGH:C14	0.71	1.98	3	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models Worst	Total
1:A:218:HIS:CD2	4:A:269:NGH:HO4	0.70	2.05	9	2
4:A:269:NGH:C11	4:A:269:NGH:H12	0.69	2.16	3	1
4:A:269:NGH:H101	4:A:269:NGH:C1	0.69	2.15	11	1
1:A:182:ALA:N	4:A:269:NGH:H133	0.69	2.02	3	1
1:A:218:HIS:CE1	1:A:237:PHE:O	0.68	2.46	9	7
1:A:181:LEU:N	4:A:269:NGH:H142	0.68	2.03	3	1
1:A:138:PHE:CD1	1:A:220:ILE:HG23	0.67	2.25	14	1
1:A:180:ILE:HG23	4:A:269:NGH:C14	0.66	2.20	3	1
1:A:236:MET:SD	1:A:258:ILE:HG22	0.66	2.30	10	1
1:A:218:HIS:CE1	1:A:222:HIS:CE1	0.66	2.80	2	2
1:A:218:HIS:NE2	1:A:222:HIS:CE1	0.66	2.64	5	3
1:A:182:ALA:N	4:A:269:NGH:H142	0.66	2.06	3	1
1:A:218:HIS:ND1	4:A:269:NGH:H72	0.66	2.06	9	1
4:A:269:NGH:S1	4:A:269:NGH:H143	0.66	2.31	13	1
1:A:218:HIS:CE1	4:A:269:NGH:N1	0.65	2.63	2	2
1:A:218:HIS:HB2	4:A:269:NGH:H72	0.65	1.68	4	2
1:A:222:HIS:CE1	1:A:226:LEU:HD21	0.65	2.26	2	2
1:A:182:ALA:H	4:A:269:NGH:C12	0.65	2.04	3	1
1:A:182:ALA:N	4:A:269:NGH:C14	0.64	2.60	3	1
1:A:217:VAL:CG1	1:A:235:VAL:HG11	0.64	2.22	17	2
1:A:145:THR:HG22	1:A:258:ILE:CD1	0.64	2.22	18	2
4:A:269:NGH:C11	4:A:269:NGH:C12	0.63	2.76	3	1
1:A:218:HIS:CE1	1:A:222:HIS:CD2	0.62	2.87	16	1
1:A:224:LEU:CD1	1:A:261:LEU:HD11	0.62	2.24	6	1
1:A:140:VAL:HG22	1:A:248:PHE:CE1	0.62	2.30	2	2
1:A:181:LEU:HB2	4:A:269:NGH:H1	0.62	1.71	12	3
1:A:218:HIS:CD2	1:A:222:HIS:CE1	0.62	2.87	7	2
1:A:226:LEU:CD1	1:A:258:ILE:HG22	0.61	2.25	6	3
1:A:182:ALA:H	4:A:269:NGH:H133	0.61	1.50	3	1
1:A:182:ALA:N	4:A:269:NGH:H102	0.61	2.05	5	2
1:A:215:THR:HG23	4:A:269:NGH:H4	0.61	1.72	13	1
1:A:218:HIS:CE1	4:A:269:NGH:O5	0.61	2.53	9	1
1:A:164:ALA:HB3	1:A:174:PHE:CZ	0.60	2.31	17	1
1:A:213:PHE:O	1:A:217:VAL:HG23	0.60	1.96	10	9
1:A:250:LEU:HD22	1:A:250:LEU:N	0.60	2.12	17	17
4:A:269:NGH:H132	4:A:269:NGH:HN1	0.59	1.58	3	1
4:A:269:NGH:C13	4:A:269:NGH:N1	0.59	2.65	3	1
1:A:141:TRP:CH2	1:A:250:LEU:HD12	0.58	2.32	7	6
1:A:134:ILE:HD12	1:A:138:PHE:CE2	0.58	2.34	10	1
1:A:140:VAL:HG12	1:A:250:LEU:HD21	0.57	1.74	8	6
1:A:226:LEU:HD12	1:A:228:HIS:H	0.57	1.57	7	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models Worst	Total
4:A:269:NGH:H132	4:A:269:NGH:N1	0.57	2.15	3	1
1:A:180:ILE:HA	4:A:269:NGH:O3	0.56	2.00	11	1
1:A:221:GLY:HA2	1:A:224:LEU:HD23	0.56	1.77	6	1
1:A:145:THR:CG2	1:A:258:ILE:HD13	0.56	2.26	18	3
1:A:181:LEU:HB2	4:A:269:NGH:H91	0.56	1.78	3	1
1:A:182:ALA:O	4:A:269:NGH:C10	0.56	2.53	5	1
1:A:222:HIS:ND1	1:A:226:LEU:HD21	0.56	2.16	7	1
1:A:141:TRP:CH2	1:A:258:ILE:HG21	0.56	2.36	16	1
1:A:218:HIS:HD1	4:A:269:NGH:C7	0.55	2.12	9	1
1:A:261:LEU:O	1:A:261:LEU:HD13	0.55	2.01	7	1
1:A:182:ALA:O	4:A:269:NGH:C13	0.55	2.54	3	1
1:A:226:LEU:HD13	1:A:236:MET:SD	0.55	2.41	19	4
1:A:147:LEU:HD11	1:A:261:LEU:HD13	0.54	1.77	16	1
1:A:238:PRO:O	4:A:269:NGH:H91	0.54	2.02	16	1
1:A:145:THR:CG2	1:A:258:ILE:HG13	0.54	2.33	17	1
1:A:136:LYS:O	1:A:140:VAL:HG23	0.54	2.03	1	10
1:A:261:LEU:HD22	1:A:261:LEU:O	0.53	2.03	9	1
1:A:218:HIS:CE1	1:A:236:MET:O	0.53	2.62	1	3
1:A:182:ALA:O	4:A:269:NGH:N1	0.53	2.42	2	3
1:A:224:LEU:HD21	1:A:226:LEU:HD12	0.53	1.79	6	1
1:A:224:LEU:HD11	1:A:261:LEU:HD11	0.53	1.81	6	1
1:A:238:PRO:O	4:A:269:NGH:S1	0.53	2.67	5	1
1:A:218:HIS:CG	4:A:269:NGH:H2	0.52	2.39	16	1
4:A:269:NGH:C1	4:A:269:NGH:C10	0.52	2.87	11	1
1:A:181:LEU:CB	4:A:269:NGH:H1	0.52	2.35	12	1
1:A:218:HIS:CD2	1:A:222:HIS:NE2	0.52	2.64	16	2
1:A:254:ASP:O	1:A:258:ILE:HG23	0.52	2.05	18	3
1:A:174:PHE:CG	1:A:175:ASP:N	0.51	2.77	13	6
1:A:182:ALA:O	4:A:269:NGH:C11	0.51	2.59	5	1
1:A:140:VAL:HG22	1:A:248:PHE:CD2	0.51	2.41	12	1
1:A:238:PRO:O	4:A:269:NGH:H5	0.51	2.06	12	1
1:A:213:PHE:CD1	1:A:245:ILE:HG22	0.50	2.41	6	4
4:A:269:NGH:C11	4:A:269:NGH:C6	0.50	2.88	5	1
4:A:269:NGH:C13	4:A:269:NGH:C11	0.50	2.89	3	1
1:A:258:ILE:HD12	1:A:259:GLN:N	0.50	2.21	8	3
1:A:180:ILE:HD13	4:A:269:NGH:H142	0.50	1.82	13	1
1:A:181:LEU:N	4:A:269:NGH:H91	0.50	2.20	3	1
1:A:134:ILE:HD11	1:A:220:ILE:HD11	0.50	1.83	10	2
1:A:196:HIS:N	1:A:196:HIS:CD2	0.50	2.80	20	3
1:A:258:ILE:O	1:A:261:LEU:HD12	0.50	2.06	7	1
1:A:182:ALA:O	4:A:269:NGH:H141	0.49	2.06	3	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models Worst	Total
1:A:214:LEU:CD2	4:A:269:NGH:H71	0.49	2.37	9	1
1:A:181:LEU:CD2	4:A:269:NGH:H1	0.49	2.38	12	1
4:A:269:NGH:O5	4:A:269:NGH:H1	0.49	2.08	19	1
1:A:144:VAL:HG12	1:A:258:ILE:HD11	0.49	1.85	4	1
1:A:164:ALA:HB3	1:A:174:PHE:CE2	0.49	2.43	11	1
1:A:147:LEU:HD13	1:A:224:LEU:HD12	0.49	1.83	16	1
1:A:138:PHE:CD1	1:A:149:PHE:CD1	0.49	3.01	10	1
4:A:269:NGH:C5	4:A:269:NGH:O5	0.49	2.61	12	1
1:A:140:VAL:HG22	1:A:248:PHE:CD1	0.48	2.42	15	1
1:A:218:HIS:HE1	4:A:269:NGH:N1	0.48	2.06	16	1
1:A:119:ASN:ND2	1:A:160:LEU:HD11	0.48	2.23	20	1
4:A:269:NGH:C13	4:A:269:NGH:HN1	0.48	2.21	3	1
4:A:269:NGH:H92	4:A:269:NGH:O5	0.48	2.09	2	1
1:A:180:ILE:CD1	4:A:269:NGH:H143	0.48	2.39	3	1
1:A:226:LEU:HD11	1:A:258:ILE:HA	0.48	1.86	11	1
1:A:181:LEU:HB2	4:A:269:NGH:H5	0.48	1.85	2	2
1:A:144:VAL:HG21	1:A:250:LEU:HD23	0.47	1.85	17	2
1:A:138:PHE:HB3	1:A:149:PHE:CD2	0.47	2.44	8	3
1:A:114:ILE:HG22	1:A:116:TYR:CE1	0.47	2.44	14	1
1:A:181:LEU:H	4:A:269:NGH:C9	0.47	2.17	3	1
1:A:217:VAL:HG21	1:A:248:PHE:CE2	0.47	2.44	13	3
1:A:145:THR:HG23	1:A:258:ILE:HG12	0.47	1.87	11	1
1:A:226:LEU:HD11	1:A:258:ILE:CG2	0.47	2.40	5	1
4:A:269:NGH:H132	4:A:269:NGH:C10	0.47	2.33	3	1
1:A:145:THR:HG22	1:A:261:LEU:CD2	0.47	2.40	11	1
4:A:269:NGH:H132	4:A:269:NGH:O3	0.46	2.10	5	1
1:A:180:ILE:HD11	4:A:269:NGH:H12	0.46	1.88	9	1
1:A:218:HIS:NE2	1:A:237:PHE:O	0.46	2.48	9	1
1:A:215:THR:HG23	4:A:269:NGH:C2	0.46	2.40	17	1
1:A:239:THR:O	4:A:269:NGH:H4	0.46	2.11	17	1
1:A:226:LEU:HD22	1:A:258:ILE:HG22	0.46	1.88	1	1
1:A:138:PHE:CD1	1:A:149:PHE:HB2	0.46	2.46	7	2
1:A:181:LEU:HD22	4:A:269:NGH:H5	0.46	1.87	19	1
1:A:181:LEU:HD22	4:A:269:NGH:O3	0.46	2.10	3	1
4:A:269:NGH:C11	4:A:269:NGH:C5	0.46	2.94	5	1
1:A:196:HIS:CD2	1:A:196:HIS:C	0.46	2.88	9	1
1:A:140:VAL:CG1	1:A:250:LEU:HD21	0.46	2.41	3	2
1:A:116:TYR:CE2	1:A:134:ILE:HD12	0.46	2.46	12	1
1:A:226:LEU:HD13	1:A:258:ILE:HG22	0.45	1.88	1	1
4:A:269:NGH:C10	4:A:269:NGH:H1	0.45	2.41	11	1
1:A:181:LEU:CD2	4:A:269:NGH:H5	0.45	2.41	15	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:138:PHE:CE1	1:A:220:ILE:HG23	0.45	2.46	14	2
1:A:114:ILE:HG21	1:A:149:PHE:CE2	0.45	2.46	3	1
1:A:234:ALA:HB1	1:A:254:ASP:CG	0.45	2.32	10	1
1:A:141:TRP:CZ2	1:A:236:MET:SD	0.45	3.10	7	1
1:A:255:ILE:HA	1:A:258:ILE:CG2	0.44	2.41	11	1
1:A:214:LEU:C	1:A:214:LEU:HD23	0.44	2.33	14	1
1:A:111:LYS:CG	1:A:114:ILE:HD11	0.44	2.43	15	1
1:A:218:HIS:NE2	1:A:222:HIS:CD2	0.44	2.83	19	1
4:A:269:NGH:C11	4:A:269:NGH:H132	0.44	2.42	3	1
1:A:145:THR:HG23	1:A:258:ILE:CD1	0.44	2.43	11	1
1:A:218:HIS:CB	4:A:269:NGH:H72	0.44	2.41	4	1
1:A:116:TYR:CD2	1:A:138:PHE:CE2	0.44	3.06	14	1
1:A:116:TYR:CE2	1:A:138:PHE:CD1	0.44	3.06	20	1
1:A:234:ALA:HB1	1:A:254:ASP:OD1	0.44	2.12	7	2
1:A:238:PRO:O	4:A:269:NGH:O2	0.43	2.36	5	1
1:A:174:PHE:CD1	1:A:174:PHE:C	0.43	2.91	13	1
1:A:250:LEU:H	1:A:250:LEU:HD22	0.43	1.72	13	2
1:A:218:HIS:CD2	1:A:218:HIS:C	0.43	2.91	17	1
1:A:239:THR:O	4:A:269:NGH:H2	0.43	2.14	13	1
1:A:116:TYR:CZ	1:A:138:PHE:CE1	0.43	3.05	18	2
1:A:222:HIS:CE1	1:A:228:HIS:CD2	0.43	3.07	14	2
1:A:250:LEU:N	1:A:250:LEU:CD2	0.43	2.81	17	1
1:A:222:HIS:CE1	1:A:228:HIS:CE1	0.43	3.06	15	1
1:A:226:LEU:HD21	1:A:257:GLY:C	0.43	2.35	17	1
1:A:141:TRP:CZ3	1:A:250:LEU:HG	0.42	2.49	16	2
1:A:218:HIS:CE1	4:A:269:NGH:C11	0.42	3.02	9	1
1:A:114:ILE:HG21	1:A:149:PHE:CE1	0.42	2.49	11	1
1:A:134:ILE:O	1:A:134:ILE:HD13	0.42	2.13	12	1
1:A:238:PRO:O	4:A:269:NGH:H1	0.42	2.13	1	3
1:A:145:THR:HG23	1:A:258:ILE:CG1	0.42	2.44	11	1
1:A:116:TYR:CE1	1:A:138:PHE:CD2	0.42	3.08	3	1
1:A:166:GLY:HA2	1:A:174:PHE:CD1	0.42	2.49	13	1
1:A:218:HIS:CE1	1:A:222:HIS:NE2	0.42	2.87	2	1
1:A:258:ILE:C	1:A:258:ILE:HD12	0.42	2.35	18	2
1:A:214:LEU:HD23	4:A:269:NGH:H71	0.42	1.91	3	1
1:A:168:HIS:O	1:A:168:HIS:CG	0.42	2.73	8	1
1:A:218:HIS:ND1	1:A:237:PHE:O	0.42	2.52	15	1
1:A:119:ASN:ND2	1:A:163:PHE:H	0.41	2.13	2	1
1:A:131:ASP:OD2	1:A:151:LYS:NZ	0.41	2.51	13	2
1:A:134:ILE:CD1	1:A:220:ILE:HD11	0.41	2.45	13	1
1:A:177:LYS:NZ	1:A:200:ASP:OD1	0.41	2.50	14	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:181:LEU:HD22	4:A:269:NGH:H1	0.41	1.93	7	1
1:A:162:VAL:HB	1:A:196:HIS:HD2	0.41	1.75	3	1
1:A:131:ASP:HB3	1:A:151:LYS:NZ	0.41	2.30	20	1
1:A:138:PHE:CZ	1:A:149:PHE:HB2	0.41	2.51	16	1
1:A:222:HIS:CD2	4:A:269:NGH:O4	0.41	2.74	9	1
1:A:152:ILE:HD12	1:A:152:ILE:O	0.41	2.16	10	1
1:A:238:PRO:O	4:A:269:NGH:O5	0.41	2.39	10	1
1:A:250:LEU:N	1:A:250:LEU:HD22	0.41	2.31	6	1
1:A:115:THR:O	1:A:157:ALA:HB1	0.40	2.16	9	1
1:A:160:LEU:HD22	1:A:161:VAL:N	0.40	2.31	20	1
1:A:218:HIS:CB	4:A:269:NGH:H2	0.40	2.46	16	1
1:A:114:ILE:N	1:A:114:ILE:HD12	0.40	2.32	7	1

6.3　Torsion angles　ⓘ

6.3.1　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 PDB entries followed by that with respect to all NMR entries. 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	147/159 (92%)	125±3 (85±2%)	18±4 (12±3%)	4±2 (3±1%)	7	41
All	All	2940/3180 (92%)	2504 (85%)	351 (12%)	85 (3%)	7	41

All 22 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	175	ASP	10
1	A	208	GLY	10
1	A	111	LYS	8
1	A	228	HIS	6
1	A	112	HIS	5
1	A	173	ALA	5
1	A	245	ILE	5
1	A	209	GLY	5
1	A	225	GLY	5
1	A	261	LEU	4

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Mol	Chain	Res	Type	Models (Total)
1	A	166	GLY	4
1	A	248	PHE	3
1	A	190	GLY	2
1	A	198	ASP	2
1	A	168	HIS	2
1	A	237	PHE	2
1	A	192	GLY	2
1	A	176	GLY	1
1	A	206	HIS	1
1	A	244	ASP	1
1	A	155	GLY	1
1	A	178	GLY	1

6.3.2 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 PDB entries followed by that with respect to all NMR entries. 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	119/128 (93%)	96±3 (81±2%)	23±3 (19±2%)	4	35
All	All	2380/2560 (93%)	1923 (81%)	457 (19%)	4	35

All 84 unique residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	239	THR	20
1	A	131	ASP	19
1	A	134	ILE	18
1	A	237	PHE	17
1	A	139	GLN	16
1	A	249	ARG	16
1	A	160	LEU	13
1	A	111	LYS	11
1	A	118	ILE	11
1	A	168	HIS	10
1	A	236	MET	10
1	A	124	ASP	9
1	A	138	PHE	9

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Mol	Chain	Res	Type	Models (Total)
1	A	218	HIS	9
1	A	212	LEU	9
1	A	148	LYS	8
1	A	205	THR	8
1	A	241	LYS	8
1	A	142	SER	7
1	A	254	ASP	7
1	A	206	HIS	7
1	A	224	LEU	7
1	A	258	ILE	7
1	A	196	HIS	7
1	A	151	LYS	6
1	A	165	ARG	6
1	A	177	LYS	6
1	A	122	THR	6
1	A	143	ASN	6
1	A	112	HIS	6
1	A	250	LEU	6
1	A	135	ARG	6
1	A	149	PHE	5
1	A	215	THR	5
1	A	117	ARG	5
1	A	226	LEU	5
1	A	244	ASP	5
1	A	248	PHE	5
1	A	185	PHE	5
1	A	159	ILE	5
1	A	163	PHE	5
1	A	200	ASP	4
1	A	210	THR	4
1	A	211	ASN	4
1	A	214	LEU	4
1	A	204	THR	4
1	A	220	ILE	4
1	A	115	THR	4
1	A	119	ASN	4
1	A	260	SER	4
1	A	194	ASP	3
1	A	222	HIS	3
1	A	153	ASN	3
1	A	128	GLU	3
1	A	183	HIS	3

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Mol	Chain	Res	Type	Models (Total)
1	A	233	LYS	3
1	A	246	ASN	3
1	A	261	LEU	3
1	A	174	PHE	3
1	A	150	SER	2
1	A	114	ILE	2
1	A	147	LEU	2
1	A	180	ILE	2
1	A	217	VAL	2
1	A	198	ASP	2
1	A	242	TYR	2
1	A	154	THR	2
1	A	197	PHE	2
1	A	199	GLU	2
1	A	202	PHE	2
1	A	130	VAL	2
1	A	251	SER	2
1	A	230	SER	1
1	A	120	ASN	1
1	A	152	ILE	1
1	A	243	VAL	1
1	A	253	ASP	1
1	A	116	TYR	1
1	A	189	SER	1
1	A	201	GLU	1
1	A	127	ARG	1
1	A	203	TRP	1
1	A	207	SER	1
1	A	181	LEU	1

6.3.3   RNA ⓘ

There are no RNA molecules in this entry.

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

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

6.5   Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.6 Ligand geometry ⓘ

Of 6 ligands modelled in this entry, 5 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds 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 is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
4	NGH	A	269	2	21,21,21	2.91±0.13	7±1 (31±3%)

In the following table, the Counts columns list the number of angles for which Mogul statistics could be retrieved, the number of angles that are observed in the model and the number of 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 angle is the number of standard deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
4	NGH	A	269	2	27,29,29	2.37±0.29	7±2 (25±7%)

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	NGH	A	269	2	1±0,1,5,5	0±0,24,24,24	0±0,1,1,1

All unique bond outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
4	A	269	NGH	S1-N	11.06	1.79	1.63	11	20
4	A	269	NGH	O4-N1	5.07	1.27	1.40	4	20
4	A	269	NGH	O2-S1	4.99	1.49	1.43	6	20
4	A	269	NGH	O3-S1	4.57	1.48	1.43	14	20

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models Worst	Total
4	A	269	NGH	C6-S1	3.97	1.82	1.76	5	11
4	A	269	NGH	C9-C12	3.33	1.43	1.52	3	1
4	A	269	NGH	O5-C11	3.16	1.29	1.23	5	14
4	A	269	NGH	C11-N1	3.04	1.35	1.32	13	8
4	A	269	NGH	C10-N	2.87	1.52	1.47	12	14
4	A	269	NGH	C9-N	2.54	1.43	1.47	3	1
4	A	269	NGH	C10-C11	2.50	1.56	1.52	4	3

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})	Models Worst	Total
4	A	269	NGH	C12-C9-N	10.46	100.30	112.41	3	2
4	A	269	NGH	O4-N1-C11	8.00	131.62	119.79	17	20
4	A	269	NGH	C6-S1-N	6.87	99.11	107.30	6	20
4	A	269	NGH	O3-S1-N	6.09	112.24	106.69	3	20
4	A	269	NGH	C10-C11-N1	5.21	126.72	115.25	3	8
4	A	269	NGH	O2-S1-N	4.76	111.03	106.69	6	19
4	A	269	NGH	O5-C11-N1	4.32	117.96	123.27	3	7
4	A	269	NGH	O5-C11-C10	3.50	114.95	121.08	16	5
4	A	269	NGH	C1-C6-S1	3.50	123.44	119.76	11	4
4	A	269	NGH	O3-S1-O2	3.21	114.32	119.52	12	20
4	A	269	NGH	C10-N-S1	3.20	109.94	117.85	16	2
4	A	269	NGH	C9-N-S1	2.62	123.28	117.52	1	1
4	A	269	NGH	C13-C12-C9	2.46	100.86	111.02	3	1
4	A	269	NGH	C4-C5-C6	2.28	121.81	119.45	12	4
4	A	269	NGH	C14-C12-C13	2.26	120.92	110.51	3	1
4	A	269	NGH	C2-C1-C6	2.10	121.62	119.45	12	2

All unique chiral outliers are listed below.

Mol	Chain	Res	Type	Atoms	Models (Total)
4	A	269	NGH	N	9

There are no torsion outliers.

There are no ring outliers.

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 NGH A 269

Bond lengths

Bond angles

Torsions

Rings
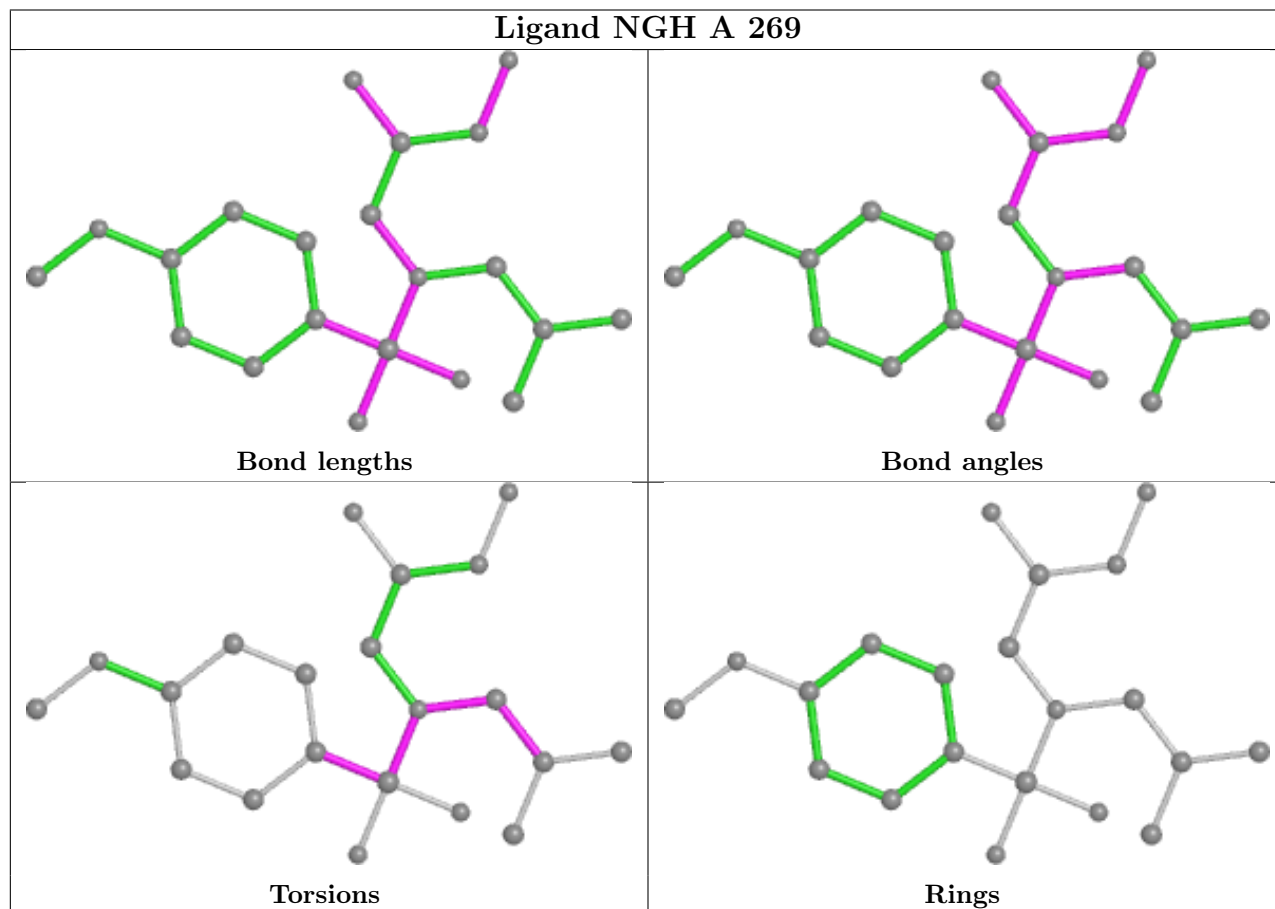
6.7 Other polymers ⓘ

There are no such molecules in this entry.

6.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

7 Chemical shift validation (i)

No chemical shift data were provided