12381 measured reflections

 $R_{\rm int} = 0.032$

4546 independent reflections

2926 reflections with $I > 2\sigma(I)$

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1-(3-Phenylisoguinolin-1-yl)hydrazine

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Key indicators: single-crystal X-ray study; T = 290 K; mean σ (C–C) = 0.003 Å; R factor = 0.047; wR factor = 0.116; data-to-parameter ratio = 10.6.

The title compound, $C_{15}H_{13}N_3$, contains two independent molecules in the asymmetric unit. The isoquinoline moiety and phenyl rings form dihedral angles of 4.38 (2) and 10.14 (3) $^{\circ}$ in the two independent molecules. The crystal packing is stabilized by N-H···N molecular dimers formed across a center of symmetry.

Related literature

For general background to hydrazine compounds, see: Broadhurst et al. (2001); Behrens (1999); Broadhurst (1991); Chao et al. (1999); Kametani (1968). For related crystal structures, see: Yang et al. (2008); Choudhury & Guru Row (2006); Choudhury et al. (2002); Hathwar et al. (2008). For bond-length data, see: Allen et al. (1998). For hydrogen-bond motifs, see: Bernstein et al. (1995).



Experimental

Crystal data

C15H13N3 $M_r = 235.28$ Triclinic, P1 a = 6.672 (2) Å b = 13.825 (4) Å c = 14.934 (5) Å $\alpha = 63.836(5)^{\circ}$ $\beta = 86.895 \ (6)^{\circ}$

 $\gamma = 82.106 \ (5)^{\circ}$ V = 1224.5 (7) Å³ Z = 4Mo $K\alpha$ radiation $\mu = 0.08 \text{ mm}^{-1}$ T = 290 (2) K $0.15 \times 0.12 \times 0.05 \text{ mm}$

Data collection

Bruker SMART CCD area-detector diffractometer Absorption correction: multi-scan (SADABS; Sheldrick, 1996) $T_{\min} = 0.953, T_{\max} = 0.996$

Refinement

$R[F^2 > 2\sigma(F^2)] = 0.047$	429 parameters
$wR(F^2) = 0.116$	All H-atom parameters refined
S = 1.02	$\Delta \rho_{\rm max} = 0.14 \text{ e } \text{\AA}^{-3}$
4546 reflections	$\Delta \rho_{\rm min} = -0.17 \text{ e } \text{\AA}^{-3}$

Table 1

H	lyd	lrogen-	bond	geometry	(A	۹,°)
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$D - H \cdots A$	D-H	$H \cdot \cdot \cdot A$	$D \cdots A$	$D - \mathbf{H} \cdot \cdot \cdot A$
$N2' - H2'N \cdots N3'^{i}$ $N2 - H2N \cdots N3^{ii}$ $N3' - H3'B \cdots N1'^{iii}$ $N3 - H3A \cdots N1^{iv}$	0.91 (2) 0.90 (2) 0.89 (2) 0.92 (2)	2.15 (2) 2.20 (2) 2.24 (2) 2.26 (2)	2.967 (2) 3.027 (2) 3.119 (2) 3.170 (3)	151 (2) 152 (2) 169 (2) 168 (2)

Symmetry codes: (i) -x, -y, -z; (ii) -x + 1, -y, -z + 1; (iii) -x + 1, -y, -z; (iv) -x + 2, -y, -z + 1.

Data collection: SMART (Bruker, 2004); cell refinement: SAINT (Bruker, 2004); data reduction: SAINT; program(s) used to solve structure: SHELXS97 (Sheldrick, 2008); program(s) used to refine structure: SHELXL97 (Sheldrick, 2008); molecular graphics: ORTEP-3 (Farrugia, 1999) and CAMERON (Watkin et al., 1993); software used to prepare material for publication: PLATON (Spek, 2003).

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: CS2101).

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1-(3-Phenylisoquinolin-1-yl)hydrazine

P. Manivel, V. R. Hathwar, P. Nithya, K. Prabakaran and F. N. Khan

Comment

The title compound belongs to the class isoquinolines. Isoquinolines and isoquinolinones are an integral part of many naturally occurring fused heterocycles and find applications in synthetic and pharmaceutical chemistry (Kametani *et al.*, 1968). Isoquinolinones and isoquinoline amines were reported as cancer chemotherapeutic agents (Behrens, 1999) whereas quinolyl and isoquinolyl derivatives have been reported as insecticidal compounds (Broadhurst, 1991). 3-Substituted isoquinolines are of potent use in medicine (Chao, *et al.*, 1999) and in general, hydrazine derivatives can be used as medicaments (Broadhurst *et al.*, 2001). Choudhury, *et al.* (2002, 2006) reported crystal structures of substituted isoquinolines while Hathwar, *et al.* (2008) reports the crystal structure of an isoquinolinyl diselenide.

The asymmetric unit of the crystal structure of the title compound contains two independent molecules (Fig. 1). The isoquinoline moiety and phenyl rings form dihedral angles of 4.38 (2) and 10.14 (3)°, respectively, in the two independent molecules. All bond lengths and angles are normal (Allen *et al.*, 1998). The packing (Fig. 2) is consolidated by four N—H···N hydrogen bonds. All the four N—H···N hydrogen bonds generate dimers across centres of symmetry (Table 1) resulting in tight molecular packing in the crystal. The N2'-H2'N···N3' and the N2—H2N···N3 hydrogen bonds form a $R^2_2(6)$ motif whereas the N3'-H3'B···N1' and the N3—H3A···N1 hydrogen bond dimers form a $R^2_2(10)$ motif (Bernstein *et al.*, 1995) in the crystal (Fig. 2).

Experimental

The solution of 1-chloro-3-phenylisoquioline in ethanol was treated with hydrazine hydrate and stirred at 323 K for 3hr. The product was filtered. The solid was washed with water and diethyl ether and dried under vacuum. Single crystals of the title compound were obtained via recrystalization from a dichloromethane solution.

Refinement

All the H atoms in the title compound were located from difference electron density maps and refined isotropically resulting in C—H and N—H bond lenghts of 0.91 (4) - 1.02 (2)Å and 0.89 (2) - 0.97 (3)Å, respectively.

Figures



Fig. 1. *ORTEP* diagram of the asymmetric unit of (I) with 50% probability displacement ellipsoids.



Fig. 2. A packing excerpt from the crystal with dotted lines indicating intermolecular N—H···N hydrogen bonds. H atoms not involved in the interactions are omitted for clarity.

1-(3-Phenylisoquinolin-1-yl)hydrazine

Crystal data	
C ₁₅ H ₁₃ N ₃	Z = 4
$M_r = 235.28$	$F_{000} = 496$
Triclinic, P1	$D_{\rm x} = 1.276 \ {\rm Mg \ m^{-3}}$
Hall symbol: -P 1	Mo $K\alpha$ radiation $\lambda = 0.71073$ Å
a = 6.672 (2) Å	Cell parameters from 832 reflections
b = 13.825 (4) Å	$\theta = 1.7 - 25.3^{\circ}$
c = 14.934 (5) Å	$\mu = 0.08 \text{ mm}^{-1}$
$\alpha = 63.836 \ (5)^{\circ}$	T = 290 (2) K
$\beta = 86.895 \ (6)^{\circ}$	Needle, colourless
$\gamma = 82.106 \ (5)^{\circ}$	$0.15\times0.12\times0.05~mm$
V = 1224.5 (7) Å ³	

Data collection

Bruker SMART CCD area-detector diffractometer	4546 independent reflections
Radiation source: fine-focus sealed tube	2926 reflections with $I > 2\sigma(I)$
Monochromator: graphite	$R_{\rm int} = 0.032$
T = 290(2) K	$\theta_{\text{max}} = 25.5^{\circ}$
ϕ and ω scans	$\theta_{\min} = 1.5^{\circ}$
Absorption correction: multi-scan (SADABS; Sheldrick, 1996)	$h = -8 \rightarrow 8$
$T_{\min} = 0.953, T_{\max} = 0.996$	$k = -16 \rightarrow 16$
12381 measured reflections	$l = -18 \rightarrow 18$

Refinement

Refinement on F^2	Secondary atom site location: difference Fourier map
Least-squares matrix: full	Hydrogen site location: inferred from neighbouring sites
$R[F^2 > 2\sigma(F^2)] = 0.047$	All H-atom parameters refined
$wR(F^2) = 0.116$	$w = 1/[\sigma^2(F_0^2) + (0.0567P)^2]$ where $P = (F_0^2 + 2F_c^2)/3$
S = 1.02	$(\Delta/\sigma)_{max} < 0.001$

4546 reflections

$\Delta \rho_{max} = 0.14 \text{ e } \text{\AA}^{-3}$
$\Delta\rho_{min} = -0.17 \text{ e } \text{\AA}^{-3}$

429 parameters

Primary atom site location: structure-invariant direct Extinction correction: none

Fractional atomic coordinates	and isotropic or equivale	nt isotropic displacement j	parameters $(Å^2)$
1 raenonai atomic coorainates	and isotropic of equivalent	ni isoiropie aispiaeemeni p	ful differens (11)

	x	У	Z	$U_{\rm iso}*/U_{\rm eq}$
N1	0.91992 (19)	0.17183 (10)	0.48294 (10)	0.0386 (3)
N2	0.6714 (2)	0.05976 (11)	0.52799 (11)	0.0433 (4)
N3	0.7300 (2)	0.02645 (15)	0.45200 (14)	0.0471 (4)
N1'	0.4205 (2)	0.13567 (10)	0.03997 (10)	0.0391 (3)
N2'	0.1689 (2)	0.07962 (11)	-0.01722 (11)	0.0466 (4)
N3'	0.2325 (2)	-0.03027 (12)	0.04958 (15)	0.0495 (4)
C1	0.7552 (2)	0.14107 (12)	0.53468 (12)	0.0366 (4)
C2	1.0076 (2)	0.25388 (13)	0.48758 (12)	0.0406 (4)
C3	0.9290 (3)	0.30370 (15)	0.54472 (14)	0.0529 (5)
C4	0.6656 (4)	0.32080 (18)	0.66201 (16)	0.0718 (7)
C5	0.4979 (4)	0.28801 (19)	0.71627 (17)	0.0768 (7)
C6	0.4084 (4)	0.20448 (17)	0.71345 (16)	0.0666 (6)
C7	0.4885 (3)	0.15463 (16)	0.65585 (14)	0.0515 (5)
C8	0.6624 (2)	0.18705 (12)	0.59912 (12)	0.0395 (4)
С9	0.7543 (3)	0.27114 (14)	0.60246 (13)	0.0482 (5)
C10	1.1910 (2)	0.28398 (13)	0.42535 (12)	0.0431 (4)
C11	1.2553 (3)	0.23496 (16)	0.36341 (13)	0.0523 (5)
C12	1.4255 (3)	0.26016 (18)	0.30579 (15)	0.0639 (6)
C13	1.5362 (4)	0.33508 (19)	0.30874 (17)	0.0679 (6)
C14	1.4761 (3)	0.38509 (18)	0.36893 (17)	0.0655 (6)
C15	1.3048 (3)	0.36044 (16)	0.42676 (15)	0.0561 (5)
C1'	0.2527 (2)	0.16171 (13)	-0.01268 (12)	0.0385 (4)
C2'	0.5085 (2)	0.21556 (13)	0.04790 (12)	0.0406 (4)
C3'	0.4252 (3)	0.32116 (15)	0.00313 (14)	0.0531 (5)
C4'	0.1531 (4)	0.45988 (17)	-0.10239 (18)	0.0780 (7)
C5'	-0.0202 (4)	0.48553 (19)	-0.15637 (19)	0.0876 (8)
C6'	-0.1088 (4)	0.40594 (18)	-0.16610 (16)	0.0735 (7)
C7'	-0.0217 (3)	0.30071 (16)	-0.12234 (14)	0.0547 (5)
C8'	0.1569 (3)	0.27129 (13)	-0.06543 (12)	0.0411 (4)
C9'	0.2471 (3)	0.35185 (14)	-0.05511 (13)	0.0502 (5)
C10'	0.6945 (2)	0.17691 (14)	0.11012 (12)	0.0412 (4)
C11'	0.7519 (3)	0.06689 (16)	0.16619 (14)	0.0525 (5)
C12'	0.9251 (3)	0.02867 (18)	0.22499 (15)	0.0599 (5)
C13'	1.0450 (3)	0.09997 (19)	0.22820 (15)	0.0587 (5)
C14'	0.9911 (3)	0.2093 (2)	0.17264 (15)	0.0608 (6)
C15'	0.8188 (3)	0.24744 (17)	0.11461 (15)	0.0532 (5)
H2N	0.542 (3)	0.0483 (14)	0.5454 (13)	0.060 (6)*
H3	0.992 (3)	0.3609 (14)	0.5471 (12)	0.056 (5)*
H3A	0.843 (3)	-0.0248 (16)	0.4726 (14)	0.075 (7)*
H3B	0.761 (3)	0.0880 (17)	0.3956 (15)	0.078 (7)*

H4	0.733 (3)	0.3797 (16)	0.6607 (14)	0.082 (7)*
H5	0.438 (3)	0.3227 (17)	0.7544 (16)	0.094 (7)*
H2'N	0.038 (3)	0.0910 (13)	-0.0365 (12)	0.053 (5)*
H6	0.286 (3)	0.1827 (16)	0.7500 (15)	0.084 (7)*
H3'A	0.269 (3)	-0.0320 (14)	0.1126 (14)	0.065 (6)*
H3'B	0.341 (3)	-0.0536 (16)	0.0238 (15)	0.076 (7)*
H7	0.423 (3)	0.1003 (14)	0.6516 (12)	0.055 (5)*
H11	1.172 (3)	0.1806 (14)	0.3645 (13)	0.062 (5)*
H12	1.470 (3)	0.2194 (16)	0.2639 (15)	0.090 (7)*
H13	1.658 (3)	0.3473 (17)	0.2734 (16)	0.095 (8)*
H14	1.549 (3)	0.4356 (15)	0.3753 (13)	0.069 (6)*
H15	1.263 (3)	0.3971 (14)	0.4688 (13)	0.059 (6)*
H3'	0.492 (3)	0.3731 (15)	0.0110 (13)	0.064 (6)*
H4'	0.219 (3)	0.5136 (17)	-0.0959 (14)	0.082 (7)*
H5'	-0.082 (4)	0.5558 (19)	-0.1851 (17)	0.102 (8)*
H6'	-0.234 (3)	0.4247 (16)	-0.2025 (15)	0.080 (7)*
H7'	-0.081 (3)	0.2459 (15)	-0.1303 (13)	0.065 (6)*
H11'	0.661 (3)	0.0177 (14)	0.1642 (12)	0.057 (5)*
H12'	0.964 (3)	-0.0520 (18)	0.2615 (15)	0.092 (7)*
H13'	1.164 (3)	0.0723 (15)	0.2692 (14)	0.070 (6)*
H14'	1.073 (3)	0.2590 (16)	0.1730 (14)	0.078 (6)*
H15'	0.786 (3)	0.3249 (15)	0.0727 (14)	0.069 (6)*

Atomic displacement parameters (\AA^2)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
N1	0.0333 (8)	0.0399 (8)	0.0440 (8)	-0.0050 (6)	-0.0015 (6)	-0.0194 (7)
N2	0.0385 (9)	0.0477 (9)	0.0538 (9)	-0.0105 (7)	0.0057 (7)	-0.0306 (8)
N3	0.0416 (9)	0.0510 (10)	0.0609 (11)	-0.0049 (8)	0.0013 (8)	-0.0358 (9)
N1'	0.0349 (8)	0.0393 (8)	0.0494 (8)	-0.0077 (6)	0.0027 (7)	-0.0245 (7)
N2'	0.0365 (9)	0.0386 (9)	0.0688 (11)	-0.0028 (7)	-0.0065 (8)	-0.0271 (8)
N3'	0.0420 (10)	0.0382 (9)	0.0720 (12)	-0.0014 (7)	-0.0050 (9)	-0.0281 (9)
C1	0.0341 (9)	0.0347 (9)	0.0398 (9)	-0.0008 (7)	-0.0057 (8)	-0.0155 (8)
C2	0.0388 (10)	0.0401 (10)	0.0416 (10)	-0.0052 (8)	-0.0054 (8)	-0.0161 (8)
C3	0.0572 (12)	0.0539 (12)	0.0606 (12)	-0.0214 (10)	0.0080 (10)	-0.0337 (10)
C4	0.0929 (18)	0.0715 (15)	0.0772 (15)	-0.0321 (13)	0.0289 (13)	-0.0532 (13)
C5	0.0979 (19)	0.0770 (16)	0.0769 (16)	-0.0248 (14)	0.0364 (14)	-0.0532 (14)
C6	0.0735 (15)	0.0659 (14)	0.0659 (14)	-0.0203 (12)	0.0312 (12)	-0.0341 (12)
C7	0.0539 (12)	0.0495 (11)	0.0541 (12)	-0.0111 (10)	0.0095 (9)	-0.0250 (10)
C8	0.0416 (10)	0.0374 (9)	0.0368 (9)	-0.0013 (8)	-0.0019 (8)	-0.0145 (8)
C9	0.0549 (12)	0.0462 (11)	0.0496 (11)	-0.0100 (9)	0.0041 (9)	-0.0259 (9)
C10	0.0393 (10)	0.0408 (10)	0.0415 (10)	-0.0048 (8)	-0.0055 (8)	-0.0106 (8)
C11	0.0525 (12)	0.0569 (12)	0.0458 (11)	-0.0127 (10)	0.0048 (9)	-0.0198 (10)
C12	0.0592 (14)	0.0723 (15)	0.0525 (13)	-0.0113 (11)	0.0097 (10)	-0.0205 (12)
C13	0.0505 (14)	0.0723 (15)	0.0578 (14)	-0.0092 (12)	0.0081 (11)	-0.0081 (12)
C14	0.0508 (13)	0.0575 (13)	0.0733 (15)	-0.0191 (11)	-0.0029 (12)	-0.0115 (12)
C15	0.0510 (12)	0.0508 (12)	0.0652 (14)	-0.0133 (10)	0.0005 (10)	-0.0223 (11)
C1'	0.0354 (10)	0.0413 (10)	0.0454 (10)	-0.0068 (8)	0.0065 (8)	-0.0252 (8)

C2'	0.0408 (10)	0.0411 (10)	0.0447 (10)	-0.0115 (8)	0.0077 (8)	-0.0223 (8)
C3'	0.0611 (13)	0.0420 (11)	0.0600 (12)	-0.0146 (10)	-0.0037 (10)	-0.0230 (10)
C4'	0.1021 (19)	0.0388 (12)	0.0861 (17)	-0.0059 (12)	-0.0263 (15)	-0.0189 (12)
C5'	0.115 (2)	0.0430 (14)	0.0886 (18)	0.0131 (14)	-0.0384 (16)	-0.0160 (13)
C6'	0.0877 (18)	0.0566 (14)	0.0677 (15)	0.0104 (13)	-0.0303 (13)	-0.0215 (12)
C7'	0.0602 (13)	0.0500 (12)	0.0537 (12)	-0.0013 (10)	-0.0095 (10)	-0.0231 (10)
C8'	0.0450 (10)	0.0400 (10)	0.0381 (10)	-0.0051 (8)	0.0030 (8)	-0.0174 (8)
C9'	0.0620 (13)	0.0359 (10)	0.0505 (11)	-0.0080 (9)	-0.0019 (10)	-0.0161 (9)
C10'	0.0406 (10)	0.0492 (11)	0.0424 (10)	-0.0116 (8)	0.0061 (8)	-0.0269 (9)
C11'	0.0573 (13)	0.0514 (12)	0.0513 (12)	-0.0153 (10)	-0.0051 (10)	-0.0217 (10)
C12'	0.0654 (14)	0.0609 (14)	0.0523 (12)	-0.0064 (11)	-0.0107 (10)	-0.0232 (11)
C13'	0.0533 (13)	0.0777 (16)	0.0502 (12)	-0.0078 (12)	-0.0060 (10)	-0.0322 (12)
C14'	0.0571 (13)	0.0779 (16)	0.0612 (13)	-0.0257 (12)	-0.0016 (11)	-0.0380 (13)
C15'	0.0556 (12)	0.0543 (13)	0.0575 (13)	-0.0162 (10)	-0.0002 (10)	-0.0288 (11)

Geometric parameters (Å, °)

N1-C1	1.3163 (19)	C12—C13	1.369 (3)
N1C2	1.3748 (19)	C12—H12	1.02 (2)
N2	1.3652 (19)	C13—C14	1.371 (3)
N2—N3	1.420 (2)	C13—H13	0.94 (2)
N2—H2N	0.904 (18)	C14—C15	1.381 (3)
N3—H3A	0.920 (19)	C14—H14	0.94 (2)
N3—H3B	0.93 (2)	C15—H15	0.976 (17)
N1'—C1'	1.317 (2)	C1'—C8'	1.435 (2)
N1'—C2'	1.3712 (19)	C2'—C3'	1.358 (2)
N2'—C1'	1.360 (2)	C2'—C10'	1.481 (2)
N2'—N3'	1.420 (2)	C3'—C9'	1.413 (3)
N2'—H2'N	0.903 (18)	С3'—Н3'	0.946 (18)
N3'—H3'A	0.976 (19)	C4'—C5'	1.360 (3)
N3'—H3'B	0.89 (2)	C4'—C9'	1.408 (3)
C1—C8	1.442 (2)	C4'—H4'	0.96 (2)
C2—C3	1.359 (2)	C5'—C6'	1.382 (3)
C2-C10	1.487 (2)	С5'—Н5'	0.92 (2)
С3—С9	1.414 (2)	C6'—C7'	1.361 (3)
С3—Н3	0.959 (17)	С6'—Н6'	0.96 (2)
C4—C5	1.353 (3)	C7'—C8'	1.407 (2)
C4—C9	1.408 (2)	С7'—Н7'	0.955 (18)
C4—H4	0.98 (2)	C8'—C9'	1.404 (2)
C5—C6	1.388 (3)	C10'—C11'	1.383 (2)
С5—Н5	0.94 (2)	C10'—C15'	1.389 (2)
C6—C7	1.368 (3)	C11'—C12'	1.386 (3)
С6—Н6	0.96 (2)	C11'—H11'	0.983 (17)
С7—С8	1.402 (2)	C12'—C13'	1.370 (3)
С7—Н7	0.945 (17)	C12'—H12'	1.00 (2)
С8—С9	1.407 (2)	C13'—C14'	1.370 (3)
C10-C11	1.389 (2)	C13'—H13'	0.95 (2)
C10—C15	1.391 (2)	C14'—C15'	1.374 (3)
C11—C12	1.375 (3)	C14'—H14'	0.94 (2)

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C11—H11	0.988 (18)	C15'—H15'	0.972 (18)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C1—N1—C2	119.22 (14)	C14—C13—H13	120.8 (13)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C1—N2—N3	121.14 (14)	C13—C14—C15	120.6 (2)
$\begin{array}{llllllllllllllllllllllllllllllllllll$	N3-N2-H2N 109.5 (11) C15-C14-H14 116.1 N2-N3-H3A 109.6 (12) C14-C15-C10 120.0 H3A-N3-H3B 107.2 (12) C14-C15-H15 119.5 H3A-N3-H3B 109.9 (18) C10-C15-H15 119.6 C1'-N1'-C2' 119.52 (14) N1'-C1'-N2' 117.7 C1'-N2'-N3' 120.66 (15) N1'-C1'-C8' 123.3 C1'-N2'-H2'N 119.4 (11) N2'-C1'-C8' 119.3 N3'-N2'-H2'N 112.8 (11) C3'-C2'-C10' 124.4 N2'-N3'-H3'B 108.0 (13) N1'-C2'-C8' 120.6 N1-C1-C8 123.47 (14) C9'-C3'-H3' 121.5 N2-C1-C8 118.81 (15) C5'-C4'-C9' 121.6 N1-C2-C8 118.81 (15) C5'-C4'-C9' 121.6 N1-C2-C8 128.41 (16) C9'-C4'-H4' 116.6 N1-C2-C8 128.41 (16) C9'-C4'-H4' 122.6 C2-C3-C9 120.43 (17) C4'-C5'-C6' 120.7 C2-C3-C9 120.43 (17) C4'-C5'-H5' 120.7 C2-C3-H3 120.7 (10) C6'-C7'-H7' 120.7	C1—N2—H2N	122.1 (11)	C13—C14—H14	123.3 (12)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	N3—N2—H2N	109.5 (11)	C15—C14—H14	116.1 (12)
$\begin{array}{ccccccc} N2-N3-H3B & 107.2 (12) & C14-C15-H15 & 119.7 (11) \\ H3A-N3-H3B & 109.9 (18) & C10-C15-H15 & 119.8 (11) \\ C1'-N1'-C2' & 119.5 (14) & N1'-C1'-N2' & 117.49 (15) \\ C1'-N2'-H2N & 119.4 (11) & N2'-C1'-C8' & 119.13 (15) \\ N3'-N2'-H2N & 119.4 (11) & O3'-C2'-N1' & 121.27 (16) \\ N2'-N3'-H3YA & 107.7 (11) & C3'-C2'-C10' & 123.79 (16) \\ N2'-N3'-H3YB & 108.0 (13) & N1'-C2'-C10' & 114.93 (15) \\ H3'A-N3'-H3'B & 109.2 (17) & C2'-C3'-C9' & 120.53 (17) \\ N1-C1-N2 & 117.71 (15) & C2'-C3'-C9' & 120.53 (17) \\ N1-C1-N2 & 117.71 (15) & C2'-C3'-H3' & 117.9 (11) \\ N2'-C1'-C8 & 123.47 (14) & C9'-C3'-H3' & 121.5 (11) \\ N2'-C1-C8 & 118.81 (15) & C5'-C4'-C9' & 121.0 (2) \\ C3-C2-N1 & 121.64 (16) & C5'-C4'-H4' & 122.4 (12) \\ C3-C2-C10 & 115.22 (15) & C4'-C5'-C6' & 120.7 (2) \\ C2-C3-C9 & 120.43 (17) & C4'-C5'-H5' & 120.1 (15) \\ C2-C3-H3 & 120.7 (10) & C6'-C5' & 120.1 (2) \\ C5-C4-C9 & 121.3 (2) & C7'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 120.0 (12) \\ C9-C3-H3 & 118.9 (10) & C7'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 120.0 (12) \\ C9-C3-H3 & 118.9 (10) & C7'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 120.0 (12) \\ C9-C3-H3 & 118.9 (10) & C7'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 120.0 (12) \\ C9-C3-H5 & 120.7 (14) & C8'-C7'-H7' & 120.2 (11) \\ C6-C5-H5 & 119.0 (14) & C9'-C3'-C7' & 119.44 (17) \\ C7'-C6-C5 & 120.5 (2) & C9'-C8'-C1' & 116.33 (15) \\ C7'-C6-H6 & 119.1 (12) & C7'-C8'-C1' & 116.33 (15) \\ C7'-C6-H6 & 120.4 (12) & C8'-C9'-C3' & 118.95 (16) \\ C6-C7-H7 & 120.4 (10) & C1'-C10'-C15' & 117.18 (17) \\ C7'-C8-C9 & 119.24 (16) & C11'-C10'-C15' & 117.18 (17) \\ C7'-C8-C9 & 119.24 (16) & C11'-C10'-C15' & 117.18 (17) \\ C7'-C8-C9 & 119.24 (16) & C11'-C10'-C15' & 118.95 (16) \\ C6-C7-H7 & 119.44 (16) & C15'-C11'-H11' & 116.7 (10) \\ C8-C9-C3 & 118.91 (16) & C12'-C11'-H11' & 121.91 (10) \\ C4-C9-C3 & 118.91 (16) & C12'-C11'-H11' & 121.91 (10) \\ C4-C9-C3 & 118.91 (16) & C12'-C11'-H11' & 121.91 (10) \\ C4-C9-C3 & 1$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N2—N3—H3A	109.6 (12)	C14—C15—C10	120.6 (2)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N2—N3—H3B	107.2 (12)	C14—C15—H15	119.7 (11)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	H3A—N3—H3B	109.9 (18)	C10—C15—H15	119.8 (11)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C1'—N1'—C2'	119.52 (14)	N1'—C1'—N2'	117.49 (15)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C1'—N2'—N3'	120.66 (15)	N1'—C1'—C8'	123.38 (14)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N3—N2—H2N 112.8 (11) C3—C2—N1' 121.2 N2—N3—H3'A 107.7 (11) C3—C2'—C10' 123.3 N2—N3—H3'B 108.0 (13) N1'—C2—C10' 114.4 H3'A—N3—H3'B 109.2 (17) C2'—C3'—C9' 120.3 N1—C1—N2 117.71 (15) C2'—C3'—H3' 117.7 N1—C1—R2 117.71 (15) C2'—C3'—H3' 121.3 N2—C1—C8 118.81 (15) C5'—C4'—C9' 121.6 C3—C2—C10 123.14 (16) C9'—C4'—H4' 122.6 C3—C2—C10 115.22 (15) C4'—C5'—C6' 120.7 C2—C3—H3 120.7 (10) C6—C5'—H5' 120.7 C5—C4—C9 121.3 (2) C7—C6—H6' 119.9 C5—C4—H4 123.4 (12) C5'—C6'—H6' 120.7 C4—C5—G6 120.2 (2) C6'—C7'—C8' 120.7 C4—C5—H5	C1'—N2'—H2'N	119.4 (11)	N2'—C1'—C8'	119.13 (15)
$\begin{array}{cccccc} N2'-N3'-H3'A & 107.7 (11) & C3'-C2'-C10' & 123.79 (16) \\ N2'-N3'-H3'B & 108.0 (13) & N1'-C2'-C10' & 114.93 (15) \\ H3'A-N3'-H3'B & 109.2 (17) & C2'-C3'-C9' & 120.53 (17) \\ N1-C1-N2 & 117.71 (15) & C2'-C3'-H3' & 117.9 (11) \\ N1-C1-C8 & 123.47 (14) & C9'-C3'-H3' & 121.5 (11) \\ N2-C1-C8 & 118.81 (15) & C5'-C4'-C9' & 121.0 (2) \\ C3-C2-N1 & 121.64 (16) & C5'-C4'-H4' & 122.4 (12) \\ C3-C2-C10 & 123.14 (16) & C9'-C4'-H4' & 122.4 (12) \\ C3-C2-C10 & 115.22 (15) & C4'-C5'-C6' & 120.7 (2) \\ C2-C3-C9 & 120.43 (17) & C4'-C5'-H5' & 120.1 (15) \\ C2-C3-H3 & 120.7 (10) & C6'-C5'-H5' & 120.1 (15) \\ C2-C3-H3 & 118.9 (10) & C7'-C6'-C5' & 120.1 (2) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 119.9 (12) \\ C9-C4-H4 & 15.3 (12) & C6'-C7'-K'' & 120.6 (2) \\ C4-C5-H5 & 120.7 (14) & C8'-C7'-H7' & 120.2 (11) \\ C4-C5-H5 & 120.7 (14) & C8'-C7'-H7' & 120.2 (11) \\ C4-C5-H5 & 120.7 (14) & C8'-C7'-H7' & 120.2 (11) \\ C4-C5-H5 & 120.7 (14) & C8'-C7'-H7' & 120.2 (11) \\ C4-C5-H5 & 120.7 (14) & C8'-C7'-H7' & 119.2 (11) \\ C6-C5-C6-H6 & 120.4 (12) & C8'-C9'-C4' & 118.31 (15) \\ C7-C6-H6 & 119.0 (14) & C9'-C8'-C7' & 119.44 (17) \\ C7-C6-H6 & 119.1 (12) & C7'-C8'-C1' & 124.19 (16) \\ C5-C5-H6 & 120.4 (12) & C8'-C9'-C3' & 123.93 (16) \\ C6-C7-H7 & 120.4 (16) & C11'-C10'-C15' & 117.18 (17) \\ C7-C8-C9 & 119.24 (16) & C11'-C10'-C15' & 117.18 (17) \\ C7-C8-C9 & 119.24 (16) & C11'-C10'-C15' & 118.93 (16) \\ C6-C7-H7 & 120.4 (16) & C11'-C10'-C15' & 118.93 (16) \\ C6-C7-H7 & 120.4 (16) & C11'-C10'-C15' & 112.49 (18) \\ C8-C9-C4 & 118.37 (18) & C10'-C11'-H11' & 116.7 (10) \\ C8-C9-C3 & 122.71 (18) & C13'-C12'-L12' & 121.25 (12) \\ C11-C10-C15 & 117.55 (18) & C13'-C12'-L12' & 121.25 (12) \\ C11-C10-C15 & 117.55 (18) & C13'-C12'-L12' & 121.25 (12) \\ C11-C10-C15 & 127.51 (18) & C13'-C12'-L11' & 120.2 (2) \\ C11-C10-C15 & 127.51 (18) & C13'-C12'-L11' & 120.2 (2) \\ C11-C10-C15 & 127.51 (18) & C13'-C12'-L11' & 120.2 (2) \\ C11-C10-C15 & 127.51 (18) & C13'-C12'-L11' & 120.2 (2) \\ C11-C10-C15 & 120.51 (2) \\ C1-C1-C10-C15 & 120.$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N3'—N2'—H2'N	112.8 (11)	C3'—C2'—N1'	121.27 (16)
$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N2'—N3'—H3'A	107.7 (11)	C3'—C2'—C10'	123.79 (16)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{ccccccc} H3^{A}-M3^{A}-M3^{B} & 109.2(17) & C2^{A}-C3^{A}-C9^{A} & 120.5\\ N1-C1-N2 & 117.71(15) & C2^{A}-C3^{A}-H3^{A} & 117.5\\ N1-C1-C8 & 123.47(14) & C9^{A}-C3^{A}-H3^{A} & 121.5\\ N2-C1-C8 & 118.81(15) & C5^{A}-C4^{A}-C9^{A} & 121.5\\ C3-C2-N1 & 121.64(16) & C5^{A}-C4^{A}-H4^{A} & 122.5\\ C3-C2-C10 & 123.14(16) & C9^{A}-C4^{A}-H4^{A} & 122.5\\ C3-C2-C10 & 115.22(15) & C4^{A}-C5^{A}-C6^{C} & 120.5\\ C2-C3-H3 & 120.7(10) & C6^{A}-C5^{A}-H5^{A} & 119.5\\ C9-C3-H3 & 118.9(10) & C7-C6^{A}-C5^{A} & 120.5\\ C5-C4-C9 & 121.3(2) & C7^{A}-C6^{A}-H6^{A} & 120.5\\ C9-C3-H3 & 118.9(10) & C7-C6^{A}-C5^{A} & 120.5\\ C5-C4-H4 & 123.4(12) & C5^{A}-C6^{A}-H6^{A} & 120.5\\ C9-C3-H3 & 118.9(10) & C7-C6^{A}-H6^{A} & 120.5\\ C9-C3-H3 & 118.9(10) & C7-C6^{A}-C5^{A} & 120.5\\ C5-C4-H4 & 123.4(12) & C5^{A}-C6^{A}-H6^{A} & 120.5\\ C4-C5-C6 & 120.2(2) & C6^{A}-C7^{A}-H7^{A} & 119.5\\ C6-C5-H5 & 119.0(14) & C9-C8^{A}-C7^{A} & 119.5\\ C6-C5-H5 & 119.0(14) & C9^{A}-C8^{A}-C7^{A} & 118.5\\ C6-C7-C8 & 120.5(2) & C9^{A}-C8^{A}-C1^{A} & 118.5\\ C6-C7-C8 & 120.4(12) & C8^{A}-C9^{A}-C1^{A} & 118.5\\ C6-C7-H7 & 120.1(10) & C4^{A}-C9^{A}-C3^{A} & 118.5\\ C6-C7-H7 & 120.1(10) & C4^{A}-C9^{A}-C3^{A} & 118.5\\ C6-C7-H7 & 120.1(10) & C4^{A}-C9^{A}-C3^{A} & 118.5\\ C6-C7-H7 & 119.4(16) & C11^{A}-C10^{A}-C1^{A} & 118.5\\ C6-C7-C8 & 120.4(21) & C8^{A}-C9^{A}-C1^{A} & 118.5\\ C6-C7-H7 & 120.1(10) & C4^{A}-C9^{A}-C3^{A} & 118.5\\ C6-C7-H7 & 120.1(10) & C4^{A}-C9^{A}-C3^{A} & 122.5\\ C9-C8-C1 & 146.4(16) & C15^{A}-C11^{A} & 119.5\\ C1-C10-C15 & 117.5(18) & C13^{A}-C12^{A}-H11^{A} & 121.5\\ C1-C10-C15 & 117.5(18) & C13^{A}-C12^{A}-H11^{A} & 121.5\\ C1-C10-C12 & 120.1(16) & C11^{A}-C13^{A}-H11^{A} & 121.5\\ C1-C10-C12 & 120.1(16) & C11^{A}-C13^{A}-H11^{A} & 121.5\\ C1-C10-C12 & 122.7(17) & C12^{A}-C14^{A} & 119.1\\ C12-C11-H11 & 122.8(10) & C14^{A}-C13^{A}-H13^{A} & 121.5\\ C10-C1-H11 & 122.8(10) & C14^{A}-C13^{A}-H13^{A} & 121.5\\ C10-C1-H11 & 122.8(10) & C14^{A}-C13^{A}-H13^{A} & 121.5\\ C10-C1-H11 & 115.6(10) & C14^{A}-C13^{A}-H13^{A} & 121.5\\ C10$	N2'—N3'—H3'B	108.0 (13)	N1'—C2'—C10'	114.93 (15)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	H3'A—N3'—H3'B	109.2 (17)	C2'—C3'—C9'	120.53 (17)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N1C1C8 123.47 (14) C9C3'H3' 121.5 N2C1C8 118.81 (15) C5'C4'C9' 121.0 C3C2N1 121.64 (16) C5'C4'C9' 121.0 N1C2C10 123.14 (16) C9'C4'H4' 122.4 C3C2C10 115.22 (15) C4'C5'C6' 120.7 C2C3C9 120.43 (17) C4'C5'H5' 119.7 C2C3H3 120.7 (10) C6'C5'H5' 120.7 C5C4C9 121.3 (2) C7'C6'C5' 120.7 C5C4H4 123.4 (12) C5'C6'H6' 119.9 C4C5C6 120.2 (2) C6'C7'C8' 120.0 C4C5C6 120.2 (2) C6'C7'H7' 120.7 C4C5C6 120.7 (14) C8'C7'H7' 119.2 C4C5H5 120.7 (14) C8'C7'H7' 119.2 C7C6H6 19.9 (14) C9'-C8'-C1' 116.3 C7C6-H6 120.4 (12) C8'C9'-C4' 118.1 C5C6-H6 120.4 (12) C8'-C9'-C3' 118.2 C6C7C8 120.42 (19) C8'-C9'-C3' 12	N1—C1—N2	117.71 (15)	C2'—C3'—H3'	117.9 (11)
$\begin{array}{ccccccc} N2-C1-C8 & 118.81 (15) & C5'-C4'-C9' & 121.0 (2) \\ C3-C2-N1 & 121.64 (16) & C5'-C4'-H4' & 122.4 (12) \\ C3-C2-C10 & 123.14 (16) & C9'-C4'-H4' & 116.6 (12) \\ N1-C2-C10 & 115.22 (15) & C4'-C5'-C6' & 120.7 (2) \\ C2-C3-C9 & 120.43 (17) & C4'-C5'-H5' & 120.1 (15) \\ C2-C3-H3 & 120.7 (10) & C6'-C5'-H5' & 119.2 (15) \\ C5-C4-C9 & 121.3 (2) & C7'-C6'-H6' & 119.9 (12) \\ C5-C4-H4 & 123.4 (12) & C5'-C6'-H6' & 120.0 (12) \\ C9-C3-H4 & 123.4 (12) & C5'-C6'-H6' & 120.0 (12) \\ C9-C4-H4 & 15.3 (12) & C6'-C7'-C8' & 120.6 (2) \\ C4-C5-C6 & 120.2 (2) & C6'-C7'-H7' & 120.2 (11) \\ C4-C5-H5 & 120.7 (14) & C8'-C7'-H7' & 120.2 (11) \\ C6-C5-H5 & 120.5 (2) & C9'-C8'-C1' & 116.33 (15) \\ C7-C6-H6 & 119.1 (12) & C7'-C8'-C1' & 116.33 (15) \\ C5-C4-H6 & 120.4 (12) & C8'-C9'-C3' & 118.93 (16) \\ C5-C6-H6 & 120.4 (12) & C8'-C9'-C3' & 122.94 (18) \\ C6-C7-C8 & 120.42 (19) & C8'-C9'-C3' & 122.94 (18) \\ C8-C7-H7 & 120.1 (10) & C11'-C10'-C15' & 117.18 (17) \\ C7-C8-C9 & 119.24 (16) & C11'-C10'-C15' & 117.18 (17) \\ C7-C8-C9 & 119.24 (16) & C11'-C10'-C12' & 120.30 (16) \\ C7-C8-C1 & 124.44 (16) & C15'-C10'-C12' & 120.30 (16) \\ C7-C8-C3 & 118.91 (16) & C11'-C10'-C12' & 120.2 (2) \\ C11-C10-C15 & 117.55 (18) & C13'-C12'-H12' & 118.2 (12) \\ C11'-C10-C12 & 120.17 (16) & C11'-C12'-H12' & 118.2 (12) \\ \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N1—C1—C8	123.47 (14)	C9'—C3'—H3'	121.5 (11)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N2—C1—C8	118.81 (15)	C5'—C4'—C9'	121.0 (2)
C3-C2-C10123.14 (16)C9'-C4'-H4'116.6 (12)N1-C2-C10115.22 (15)C4'-C5'-C6'120.7 (2)C2-C3-C9120.43 (17)C4'-C5'-H5'120.1 (15)C2-C3-H3120.7 (10)C6'-C5'-H5'119.2 (15)C9-C3-H3118.9 (10)C7'-C6'-C5'120.1 (2)C5-C4-C9121.3 (2)C7'-C6'-H6'119.9 (12)C5-C4-H4123.4 (12)C5'-C6-H6'120.0 (12)C9-C4-H4115.3 (12)C6'-C7'-C8'120.6 (2)C4-C5-C6120.2 (2)C6'-C7'-H7'120.2 (11)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (11)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (11)C4-C5-H5120.7 (14)C8'-C7'-H7'119.4 (17)C7-C6-H6119.0 (14)C9'-C8'-C1'116.33 (15)C7-C6-H6119.1 (12)C7'-C8'-C1'124.19 (16)C5-C6-H6120.4 (12)C8'-C9'-C3'118.93 (16)C6-C7-H7120.1 (10)C4'-C9'-C3'122.94 (18)C8-C7-H7119.4 (10)C11'-C10'-C15'117.18 (17)C7-C8-C9119.24 (16)C15'-C10'-C12'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C12'122.51 (17)C9-C8-C1116.31 (15)C10'-C11'-H11'116.7 (10)C8-C9-C3118.91 (16)C13'-C12'-C11'121.9 (10)C4-C9-C3122.71 (18)C13'-C12'-C11'120.2 (2)C11-C10-C15117.55 (18)C13'-C12'-H12'121.5 (12)C11-C10-C2120.17 (16)C11'-C12'-H12'	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C3—C2—N1	121.64 (16)	C5'—C4'—H4'	122.4 (12)
N1-C2-C10115.22 (15) $C4'-C5'-C6'$ 120.7 (2)C2-C3-C9120.43 (17) $C4'-C5'-H5'$ 120.1 (15)C2-C3-H3120.7 (10) $C6'-C5'-H5'$ 119.2 (15)C9-C3-H3118.9 (10) $C7'-C6'-C5'$ 120.1 (2)C5-C4-C9121.3 (2) $C7'-C6'-H6'$ 119.9 (12)C5-C4-H4123.4 (12) $C5'-C6'-H6'$ 120.0 (12)C9-C4-H4115.3 (12) $C6'-C7'-C8'$ 120.6 (2)C4-C5-C6120.2 (2) $C6'-C7'-H7'$ 120.2 (11)C4-C5-H5120.7 (14) $C8'-C7'-H7'$ 119.44 (17)C4-C5-H5120.5 (2) $C9'-C8'-C1'$ 116.33 (15)C7-C6-H6119.1 (12) $C7'-C8'-C1'$ 116.33 (15)C7-C6-H6120.4 (12) $C8'-C9'-C3'$ 118.93 (16)C5-C6-H6120.4 (12) $C8'-C9'-C3'$ 118.93 (16)C6-C7-H7120.1 (10) $C4'-C9'-C3'$ 122.94 (18)C8-C7-H7119.24 (16)C11'-C10'-C2'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C2'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C2'120.30 (16)C7-C8-C3118.37 (18)C10'-C11'-H11'116.7 (10)C8-C9-C3122.71 (18)C13'-C12'-H11'121.9 (10)C4-C9-C3122.71 (18)C13'-C12'-H12'121.5 (12)C11-C10-C2120.17 (16)C11'-C12'-H12'118.2 (12)	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C3—C2—C10	123.14 (16)	C9'—C4'—H4'	116.6 (12)
C2-C3-C9120.43 (17)C4'-C5'-H5'120.1 (15)C2-C3-H3120.7 (10)C6'-C5'-H5'119.2 (15)C9-C3-H3118.9 (10)C7'-C6'-C5'120.1 (2)C5-C4-C9121.3 (2)C7'-C6'-H6'119.9 (12)C5-C4-H4123.4 (12)C5'-C6'-H6'120.0 (12)C9-C4-H4115.3 (12)C6'-C7'-C8'120.6 (2)C4-C5-C6120.2 (2)C6'-C7'-H7'120.2 (1)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (11)C6-C5-H5120.5 (2)C9'-C8'-C1'116.33 (15)C7-C6-C5120.5 (2)C9'-C8'-C1'116.33 (15)C7-C6-H6119.0 (14)C9'-C8'-C1'116.33 (15)C7-C6-H6120.4 (12)C7'-C8'-C1'124.19 (16)C5-C6-H6120.4 (12)C8'-C9'-C3'118.93 (16)C6-C7-H7120.1 (10)C4'-C9'-C3'122.94 (18)C6-C7-H7119.4 (10)C11'-C10'-C15'117.18 (17)C7-C8-C9119.24 (16)C11'-C10'-C15'117.18 (17)C7-C8-C1124.44 (16)C15'-C10'-C2'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C15'117.18 (17)C7-C8-C1124.44 (16)C15'-C10'-C12'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C15'117.18 (17)C7-C8-C1124.44 (16)C15'-C10'-C12'121.42 (18)C8-C7-C7119.24 (16)C11'-C10'-C12'121.42 (18)C8-C7-C7118.37 (18)C10'-C11'-H11'121.9 (10)C4-C9-C3122.71 (18)C13'-C12'-C11' <td>$\begin{array}{cccccccccccccccccccccccccccccccccccc$</td> <td>N1—C2—C10</td> <td>115.22 (15)</td> <td>C4'—C5'—C6'</td> <td>120.7 (2)</td>	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	N1—C2—C10	115.22 (15)	C4'—C5'—C6'	120.7 (2)
C2-C3-H3120.7 (10)C6'-C5'-H5'119.2 (15)C9-C3-H3118.9 (10)C7'-C6'-C5'120.1 (2)C5-C4-C9121.3 (2)C7'-C6'-H6'119.9 (12)C5-C4-H4123.4 (12)C5'-C6'-H6'120.0 (12)C9-C4-H4115.3 (12)C6'-C7'-C8'120.6 (2)C4-C5-C6120.2 (2)C6'-C7'-H7'120.2 (11)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (11)C6-C5-H5120.5 (2)C9'-C8'-C7'119.44 (17)C7-C6-C5120.5 (2)C9'-C8'-C1'116.33 (15)C7-C6-H6119.1 (12)C7'-C8'-C1'124.19 (16)C5-C6-H6120.4 (12)C8'-C9'-C3'118.93 (16)C6-C7-H7120.1 (10)C4'-C9'-C3'122.94 (18)C6-C7-H7119.44 (16)C11'-C10'-C15'117.18 (17)C7-C8-C9119.24 (16)C11'-C10'-C12'123.03 (16)C7-C8-C1124.44 (16)C15'-C10'-C2'120.30 (16)C7-C8-C23118.37 (18)C10'-C11'-H11'116.7 (10)C8-C9-C3118.91 (16)C12'-C11'-H11'121.9 (10)C4-C9-C3122.71 (18)C13'-C12'-C11'120.2 (2)C11-C10-C15117.55 (18)C13'-C12'-H12'121.5 (12)C11-C10-C22120.17 (16)C11'-C12'-H12'118.2 (12)	C2-C3-H3120.7 (10)C6-C5'-H5'119.4C9-C3-H3118.9 (10)C7'-C6'-C5'120.3C5-C4-C9121.3 (2)C7'-C6'-H6'119.9C5-C4-H4123.4 (12)C5'-C6'-H6'120.0C9-C4-H4115.3 (12)C6'-C7'-C8'120.0C4-C5-C6120.2 (2)C6'-C7'-H7'120.5C4-C5-H5120.7 (14)C8'-C7'-H7'119.2C6-C5-H5119.0 (14)C9'-C8'-C1'116.3C7-C6-C5120.5 (2)C9'-C8'-C1'116.3C7-C6-H6119.1 (12)C7'-C8'-C1'124.1C5-C6-H6120.4 (12)C8'-C9'-C3'118.5C6-C7-H7120.4 (12)C8'-C9'-C3'118.5C6-C7-H7120.1 (10)C4'-C9'-C3'122.5C8-C7-H7119.4 (10)C11'-C10'-C15'117.1C7-C8-C1124.44 (16)C15'-C10'-C2'122.5C9-C8-C1116.31 (15)C10'-C11'-C12'124.4C8-C9-C3118.91 (16)C12'-C11'-H11'116.3C8-C9-C3122.71 (18)C13'-C12'-C11'120.2C11-C10-C15117.55 (18)C13'-C12'-C11'120.2C11-C10-C2120.17 (16)C11'-C12'-H12'118.2C11-C10-C2120.17 (16)C11'-C13'-C14'-H11'115.2C11-C10-C15117.55 (18)C13'-C12'-H12'118.2C11-C10-C2120.17 (16)C11'-C13'-H13'119.1C12-C11-H11122.8 (10)C14'-C13'-H13'119.1C12-C11-H11122.8 (10)C14'-C13'-H13'119.1 <td>C2—C3—C9</td> <td>120.43 (17)</td> <td>C4'—C5'—H5'</td> <td>120.1 (15)</td>	C2—C3—C9	120.43 (17)	C4'—C5'—H5'	120.1 (15)
C9-C3-H3118.9 (10)C7-C6'-C5'120.1 (2)C5-C4-C9121.3 (2)C7'-C6'-H6'119.9 (12)C5-C4-H4123.4 (12)C5'-C6'-H6'120.0 (12)C9-C4-H4115.3 (12)C6'-C7'-C8'120.6 (2)C4-C5-C6120.2 (2)C6'-C7'-H7'120.2 (11)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (11)C6-C5-H5119.0 (14)C9'-C8'-C7'119.44 (17)C7-C6-C5120.5 (2)C9'-C8'-C1'116.33 (15)C7-C6-H6119.1 (12)C7'-C8'-C1'124.19 (16)C5-C6-H6120.4 (12)C8'-C9'-C3'118.93 (16)C6-C7-C8120.4 (12)C8'-C9'-C3'122.94 (18)C8-C7-H7120.1 (10)C4'-C9'-C3'122.94 (18)C8-C7-H7119.4 (10)C11'-C10'-C15'117.18 (17)C7-C8-C9119.24 (16)C11'-C10'-C2'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C2'122.51 (17)C9-C8-C1116.31 (15)C10'-C11'-H11'116.7 (10)C8-C9-C3118.91 (16)C12'-C11'-H11'121.9 (10)C4-C9-C3122.71 (18)C13'-C12'-C11'120.2 (2)C11-C10-C15117.55 (18)C13'-C12'-C11'120.2 (2)C11-C10-C2120.17 (16)C11'-C12'-H12'121.5 (12)C11-C10-C2120.17 (16)C11'-C12'-H12'121.5 (12)	C9-C3-H3118.9 (10)C7C6C5'120.1C5-C4-C9121.3 (2)C7C6H6'119.9C5-C4-H4123.4 (12)C5'-C6H6'120.0C9-C4-H4115.3 (12)C6'-C7'-C8'120.0C4-C5-C6120.2 (2)C6'-C7'-H7'120.1C4-C5-H5120.7 (14)C8'-C7'-H7'119.2C6-C5-H5119.0 (14)C9'-C8'-C7'119.4C7-C6-C5120.5 (2)C9'-C8'-C1'116.3C7-C6-H6119.1 (12)C7'-C8'-C1'124.1C5-C6-H6120.4 (12)C8'-C9'-C3'118.9C6-C7-C8120.42 (19)C8'-C9'-C3'118.5C6-C7-H7120.1 (10)C4'-C9'-C3'122.5C8-C7-H7119.4 (10)C11'-C10'-C15'117.1C7-C8-C9119.24 (16)C11'-C10'-C2'120.3C7-C8-C1124.44 (16)C15'-C10'-C2'122.5C9-C8-C1116.31 (15)C10'-C11'-H11'116.7C8-C9-C3122.71 (18)C13'-C12'-C11'120.7C11-C10-C15117.55 (18)C13'-C12'-C11'120.7C11-C10-C2120.17 (16)C11'-C12'-H12'118.2C11-C10-C2120.17 (16)C11'-C12'-H12'118.2C11-C10-C2122.77 (17)C12'-C13'-H13'119.1C12-C11-H11122.8 (10)C14'-C13'-H13'119.1C12-C11-H11122.8 (10)C14'-C13'-H13'121.8C12-C11-H11122.8 (10)C14'-C13'-H13'121.8	С2—С3—Н3	120.7 (10)	C6'—C5'—H5'	119.2 (15)
C5-C4-C9121.3 (2) $C7'-C6'-H6'$ 119.9 (12)C5-C4-H4123.4 (12)C5'-C6'-H6'120.0 (12)C9-C4-H4115.3 (12)C6'-C7'-C8'120.6 (2)C4-C5-C6120.2 (2)C6'-C7'-H7'120.2 (1)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (1)C6-C5-H5119.0 (14)C9'-C8'-C7'119.44 (17)C7-C6-C5120.5 (2)C9'-C8'-C1'116.33 (15)C7-C6-H6119.1 (12)C7'-C8'-C1'124.19 (16)C5-C6-H6120.4 (12)C8'-C9'-C3'118.93 (16)C6-C7-C8120.42 (19)C8'-C9'-C3'118.93 (16)C6-C7-H7120.1 (10)C4'-C9'-C3'122.94 (18)C8-C7-H7119.44 (16)C11'-C10'-C15'117.18 (17)C7-C8-C9119.24 (16)C11'-C10'-C2'120.30 (16)C7-C8-C1124.44 (16)C15'-C10'-C2'122.51 (17)C9-C8-C1116.31 (15)C10'-C11'-H11'116.7 (10)C8-C9-C3118.91 (16)C12'-C11'-H11'121.9 (10)C4-C9-C3122.71 (18)C13'-C12'-C11'120.2 (2)C11-C10-C15117.55 (18)C13'-C12'-H12'121.5 (12)C11-C10-C2120.17 (16)C11'-C12'-H12'118.2 (12)	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	С9—С3—Н3	118.9 (10)	C7'—C6'—C5'	120.1 (2)
C5-C4-H4123.4 (12)C5'-C6'-H6'120.0 (12)C9-C4-H4115.3 (12)C6'-C7'-C8'120.6 (2)C4-C5-C6120.2 (2)C6'-C7'-H7'120.2 (1)C4-C5-H5120.7 (14)C8'-C7'-H7'119.2 (11)C6-C5-H5119.0 (14)C9'-C8'-C7'119.44 (17)C7-C6-C5120.5 (2)C9'-C8'-C1'116.33 (15)C7-C6-H6119.1 (12)C7'-C8'-C1'124.19 (16)C5-C6-H6120.4 (12)C8'-C9'-C4'118.12 (19)C6-C7-C8120.42 (19)C8'-C9'-C3'118.93 (16)C6-C7-H7120.1 (10)C4'-C9'-C3'122.94 (18)C8-C7-H7119.24 (16)C11'-C10'-C15'117.18 (17)C7-C8-C1124.44 (16)C15'-C10'-C2'120.30 (16)C7-C8-C1116.31 (15)C10'-C11'-L12'121.42 (18)C8-C9-C3118.91 (16)C12'-C11'-H11'116.7 (10)C8-C9-C3122.71 (18)C13'-C12'-C11'120.2 (2)C11-C10-C15117.55 (18)C13'-C12'-H112'121.5 (12)C11-C10-C2120.17 (16)C11'-C12'-H12'118.2 (12)	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	C5—C4—C9	121.3 (2)	С7'—С6'—Н6'	119.9 (12)
C9—C4—H4115.3 (12)C6'—C7'—C8'120.6 (2)C4—C5—C6120.2 (2)C6'—C7'—H7'120.2 (11)C4—C5—H5120.7 (14)C8'—C7'—H7'119.2 (11)C6—C5—H5119.0 (14)C9'—C8'—C7'119.44 (17)C7—C6—C5120.5 (2)C9'—C8'—C1'116.33 (15)C7—C6—H6119.1 (12)C7'—C8'—C1'124.19 (16)C5—C6—H6120.4 (12)C8'—C9'—C3'118.93 (16)C6—C7—C8120.42 (19)C8'—C9'—C3'118.93 (16)C6—C7—H7120.1 (10)C4'—C9'—C3'122.94 (18)C8—C7—H7119.24 (16)C11'—C10'—C15'117.18 (17)C7—C8—C1124.44 (16)C15'—C10'—C2'120.30 (16)C7—C8—C1116.31 (15)C10'—C11'—H11'116.7 (10)C8—C9—C4118.37 (18)C10'—C11'—H11'121.9 (10)C4—C9—C3122.71 (18)C13'—C12'—C11'120.2 (2)C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C9-C4-H4 115.3 (12) C6'-C7'-C8' 120.0 (2) C4-C5-C6 120.2 (2) C6'-C7'-H7' 120.7 (14) C4-C5-H5 120.7 (14) C8'-C7'-H7' 119.2 (2) C6-C5-H5 119.0 (14) C9'-C8'-C7' 119.4 (10) C7-C6-C5 120.5 (2) C9'-C8'-C1' 116.3 (15) C7-C6-H6 120.4 (12) C8'-C9'-C4' 118.9 (16) C6-C7-C8 120.42 (19) C8'-C9'-C3' 112.9 (12) C6-C7-H7 120.1 (10) C4'-C9'-C3' 122.9 (12) C8-C7-H7 120.1 (10) C4'-C9'-C3' 122.9 (12) C7-C8-C9 119.24 (16) C11'-C10'-C15' 117.3 (12) C7-C8-C1 124.44 (16) C15'-C10'-C2' 122.9 (12) C8-C9-C4 118.37 (18) C10'-C11'-H11' 116.37 (15) C10-C11-C10 116.31 (15) C10'-C11'-H11' 121.6 (2) C11-C10-C2 120.17 (16) C11'-C12'-H12' 121.6 (2) C11-C10-C15 117.55 (18) C13'-C12'-H12' 118.2 (10) C11-C10-C2 120.17 (16) C11'-C12'-H12' 118.2 (10) C12-C11-H11 12	С5—С4—Н4	123.4 (12)	С5'—С6'—Н6'	120.0 (12)
C4—C5—C6 $120.2 (2)$ C6'—C7'—H7' $120.2 (1)$ C4—C5—H5 $120.7 (14)$ C8'—C7'—H7' $119.2 (11)$ C6—C5—H5 $119.0 (14)$ C9'—C8'—C7' $119.44 (17)$ C7—C6—C5 $120.5 (2)$ C9'—C8'—C1' $116.33 (15)$ C7—C6—H6 $119.1 (12)$ C7'—C8'—C1' $124.19 (16)$ C5—C6—H6 $120.4 (12)$ C8'—C9'—C4' $118.12 (19)$ C6—C7—C8 $120.42 (19)$ C8'—C9'—C3' $118.93 (16)$ C6—C7—H7 $120.1 (10)$ C4'—C9'—C3' $122.94 (18)$ C8—C7—H7 $119.24 (16)$ C11'—C10'—C15' $117.18 (17)$ C7—C8—C9 $119.24 (16)$ C11'—C10'—C2' $120.30 (16)$ C7—C8—C1 $124.44 (16)$ C15'—C10'—C2' $122.51 (17)$ C9—C8—C1 $116.31 (15)$ C10'—C11'—H11' $116.7 (10)$ C8—C9—C4 $118.91 (16)$ C12'—C11'—H11' $121.9 (10)$ C4—C9—C3 $122.71 (18)$ C13'—C12'—C11' $120.2 (2)$ C11—C10—C15 $117.55 (18)$ C13'—C12'—H12' $118.2 (12)$	C4—C5—C6120.2 (2)C6'—C7'—H7'120.2C4—C5—H5120.7 (14)C8'—C7'—H7'119.2C6—C5—H5119.0 (14)C9'—C8'—C1'116.3C7—C6—C5120.5 (2)C9'—C8'—C1'116.3C7—C6—H6119.1 (12)C7'—C8"—C1'124.3C5—C6—H6120.4 (12)C8'—C9'—C4'118.1C6—C7—C8120.42 (19)C8'—C9'—C3'118.5C6—C7—H7120.1 (10)C4'—C9'—C3'122.5C8—C7—H7119.4 (10)C11'—C10'—C15'117.1C7—C8—C9119.24 (16)C11'—C10'—C2'120.5C7—C8—C1124.44 (16)C15'—C10'—C2'122.5C9—C8—C1116.31 (15)C10'—C11'—H11'116.7C8—C9—C3118.91 (16)C12'—C11'—H11'116.7C8—C9—C3122.71 (18)C13'—C12'—C11'120.2C11—C10—C15117.55 (18)C13'—C12'—C11'120.2C11—C10—C15117.55 (18)C13'—C12'—H12'118.2C15—C10—C2120.27 (17)C12'—C13'—C14'119.1C12—C11—H11122.8 (10)C14'—C13'—H13'119.1C12—C11—H11122.8 (10)C14'—C13'—H13'121.8C10—C11—H11115.6 (10)C14'—C15'120.8	С9—С4—Н4	115.3 (12)	C6'—C7'—C8'	120.6 (2)
C4—C5—H5120.7 (14)C8'—C7'—H7'119.2 (1)C6—C5—H5119.0 (14)C9'—C8'—C7'119.44 (17)C7—C6—C5120.5 (2)C9'—C8'—C1'116.33 (15)C7—C6—H6119.1 (12)C7'—C8'—C1'124.19 (16)C5—C6—H6120.4 (12)C8'—C9'—C4'118.12 (19)C6—C7—C8120.42 (19)C8'—C9'—C3'118.93 (16)C6—C7—H7120.1 (10)C4'—C9'—C3'122.94 (18)C8—C7—H7119.24 (16)C11'—C10'—C15'117.18 (17)C7—C8—C9119.24 (16)C11'—C10'—C2'120.30 (16)C7—C8—C1124.44 (16)C15'—C10'—C2'122.51 (17)C9—C8—C1116.31 (15)C10'—C11'—H11'116.7 (10)C8—C9—C3118.91 (16)C12'—C11'—H11'121.9 (10)C4—C9—C3122.71 (18)C13'—C12'—C11'120.2 (2)C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C4—C5—H5120.7 (14) $C8'-C7'-H7'$ 119.2C6—C5—H5119.0 (14) $C9'-C8'-C7'$ 119.4C7—C6—C5120.5 (2) $C9'-C8'-C1'$ 116.3C7—C6—H6119.1 (12) $C7'-C8'-C1'$ 124.3C5—C6—H6120.4 (12) $C8'-C9'-C4'$ 118.1C6—C7—C8120.42 (19) $C8'-C9'-C3'$ 118.5C6—C7—H7120.1 (10) $C4'-C9'-C3'$ 122.5C8—C7—H7119.4 (10) $C11'-C10'-C15'$ 117.1C7—C8—C9119.24 (16) $C11'-C10'-C2'$ 120.3C7—C8—C1124.44 (16) $C15'-C10'-C2'$ 122.5C9—C8—C1116.31 (15) $C10'-C11'-H11'$ 116.7C8=C9—C4118.37 (18) $C10'-C11'-H11'$ 116.7C8=C9—C3122.71 (18) $C13'-C12'-C11'$ 120.2C11—C10—C15117.55 (18) $C13'-C12'-H12'$ 118.2C11-C10—C2120.17 (16) $C11'-C12'-H12'$ 118.2C15—C10—C2122.27 (17) $C12'-C13'-C14'$ 119.1C12—C11—H11122.8 (10) $C14'-C13'-H13'$ 119.1C12—C11-H11122.8 (10) $C14'-C15'_{-}$ 120.5	C4—C5—C6	120.2 (2)	С6'—С7'—Н7'	120.2 (11)
C6—C5—H5119.0 (14)C9'—C8'—C7'119.44 (17)C7—C6—C5120.5 (2)C9'—C8'—C1'116.33 (15)C7—C6—H6119.1 (12)C7'—C8'—C1'124.19 (16)C5—C6—H6120.4 (12)C8'—C9'—C4'118.12 (19)C6—C7—C8120.42 (19)C8'—C9'—C3'118.93 (16)C6—C7—H7120.1 (10)C4'—C9'—C3'122.94 (18)C8—C7—H7119.4 (10)C11'—C10'—C15'117.18 (17)C7—C8—C9119.24 (16)C11'—C10'—C2'120.30 (16)C7—C8—C1124.44 (16)C15'—C10'—C2'122.51 (17)C9—C8—C1116.31 (15)C10'—C11'—C12'121.42 (18)C8—C9—C3118.91 (16)C12'—C11'—H11'116.7 (10)C8—C9—C3122.71 (18)C13'—C12'—C11'120.2 (2)C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C6-C5-H5119.0 (14)C9'-C8'-C7'119.4C7-C6-C5120.5 (2)C9'-C8'-C1'116.3C7-C6-H6119.1 (12)C7'-C8'-C1'124.3C5-C6-H6120.4 (12)C8'-C9'-C4'118.1C6-C7-C8120.42 (19)C8'-C9'-C3'122.5C6-C7-H7120.1 (10)C4'-C9'-C3'122.5C8-C7-H7119.4 (10)C11'-C10'-C15'117.1C7-C8-C9119.24 (16)C11'-C10'-C2'120.3C7-C8-C1124.44 (16)C15'-C10'-C2'122.5C9-C8-C1116.31 (15)C10'-C11'-H11'116.7C8-C9-C4118.37 (18)C10'-C11'-H11'121.5C4-C9-C3122.71 (18)C13'-C12'-C11'120.4C11-C10-C15117.55 (18)C13'-C12'-H12'118.2C11-C10-C2120.17 (16)C11'-C12'-H12'118.2C12-C11-C10121.6 (2)C12'-C13'-C14'119.1C12-C11-H11122.8 (10)C14'-C13'-H13'121.5C10-C11-H11115.6 (10)C13'-C14'-C15'120.5	C4—C5—H5	120.7 (14)	C8'—C7'—H7'	119.2 (11)
C7C6C5120.5 (2)C9'C8'C1'116.33 (15)C7C6H6119.1 (12)C7'C8'C1'124.19 (16)C5C6H6120.4 (12)C8'C9'C4'118.12 (19)C6C7C8120.42 (19)C8'C9'C3'118.93 (16)C6C7H7120.1 (10)C4'C9'C3'122.94 (18)C8C7H7119.4 (10)C11'C10'C15'117.18 (17)C7C8C9119.24 (16)C11'C10'C2'120.30 (16)C7C8C1124.44 (16)C15'C10'C2'122.51 (17)C9C8C1116.31 (15)C10'C11'C12'121.42 (18)C8C9C3118.91 (16)C12'C11'H11'116.7 (10)C4C9C3122.71 (18)C13'C12'C11'120.2 (2)C11C10C2120.17 (16)C11'C12'H12'121.5 (12)C11C10C2120.17 (16)C11'C12'H12'118.2 (12)	C7C6C5120.5 (2)C9'C8'C1'116.3C7C6H6119.1 (12)C7'C8'C1'124.3C5C6H6120.4 (12)C8'C9'C4'118.1C6C7C8120.42 (19)C8'C9'C3'122.9C6C7H7120.1 (10)C4'C9'C3'122.9C8C7H7119.4 (10)C11'C10'C15'117.1C7C8C9119.24 (16)C11'C10'C2'120.3C7C8C9119.24 (16)C11'C10'C2'122.5C9C8C1124.44 (16)C15'C10'C2'122.5C9C8C1116.31 (15)C10'C11'H11'116.7C8C9C3118.91 (16)C12'C11'H11'116.7C8C9C3122.71 (18)C13'C12'C11'120.2C11C10C15117.55 (18)C13'C12'H12'121.5C11C10C2120.17 (16)C11'C12'H12'118.2C15C10C2122.27 (17)C12'C13'C14'119.1C12C11L11122.8 (10)C14'C13'H13'119.1C12C11H11122.8 (10)C14'C13'H13'121.8C10C11H11122.8 (10)C14'C15'C14'C15'120.5	С6—С5—Н5	119.0 (14)	C9'—C8'—C7'	119.44 (17)
C7—C6—H6119.1 (12)C7'—C8'—C1'124.19 (16)C5—C6—H6120.4 (12)C8'—C9'—C4'118.12 (19)C6—C7—C8120.42 (19)C8'—C9'—C3'118.93 (16)C6—C7—H7120.1 (10)C4'—C9'—C3'122.94 (18)C8—C7—H7119.4 (10)C11'—C10'—C15'117.18 (17)C7—C8—C9119.24 (16)C11'—C10'—C2'120.30 (16)C7—C8—C9119.24 (16)C15'—C10'—C2'122.51 (17)C9—C8—C1124.44 (16)C15'—C10'—C2'121.42 (18)C8—C9—C4118.37 (18)C10'—C11'—H11'116.7 (10)C8—C9—C3118.91 (16)C12'—C11'—H11'121.9 (10)C4—C9—C3122.71 (18)C13'—C12'—C11'120.2 (2)C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C7C6H6119.1 (12)C7'C8'C1'124.1C5C6H6120.4 (12)C8'C9'C4'118.1C6C7C8120.42 (19)C8'C9'C3'122.9C6C7H7120.1 (10)C4'C9'C3'122.9C8C7H7119.4 (10)C11'C10'C15'117.1C7C8C9119.24 (16)C11'C10'C2'120.3C7C8C9119.24 (16)C15'C10'C2'122.5C9C8C1124.44 (16)C15'C10'C2'122.5C9C8C1116.31 (15)C10'C11'H11'116.7C8C9C3118.91 (16)C12'C11'H11'121.5C4C9C3122.71 (18)C13'C12'C11'120.2C11C10C15117.55 (18)C13'C12'H12'118.2C11C10C2120.17 (16)C11'C12'H12'118.2C15C10C2122.27 (17)C12'C13'C14'119.1C12C11H11122.8 (10)C14'C13'H13'119.1C12C11H11122.8 (10)C14'C15'120.5	C7—C6—C5	120.5 (2)	C9'—C8'—C1'	116.33 (15)
C5—C6—H6120.4 (12) $C8'-C9'-C4'$ 118.12 (19)C6—C7—C8120.42 (19) $C8'-C9'-C3'$ 118.93 (16)C6—C7—H7120.1 (10) $C4'-C9'-C3'$ 122.94 (18)C8—C7—H7119.4 (10)C11'-C10'-C15'117.18 (17)C7—C8—C9119.24 (16)C11'-C10'-C2'120.30 (16)C7-C8—C1124.44 (16)C15'-C10'-C2'122.51 (17)C9-C8—C1116.31 (15)C10'-C11'-C12'121.42 (18)C8-C9—C4118.37 (18)C10'-C11'-H11'116.7 (10)C8-C9—C3122.71 (18)C13'-C12'-C11'120.2 (2)C11-C10-C15117.55 (18)C13'-C12'-H12'121.5 (12)C11-C10-C2120.17 (16)C11'-C12'-H12'118.2 (12)	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	С7—С6—Н6	119.1 (12)	C7'—C8'—C1'	124.19 (16)
C6-C7-C8 $120.42 (19)$ $C8'-C9'-C3'$ $118.93 (16)$ $C6-C7-H7$ $120.1 (10)$ $C4'-C9'-C3'$ $122.94 (18)$ $C8-C7-H7$ $119.4 (10)$ $C11'-C10'-C15'$ $117.18 (17)$ $C7-C8-C9$ $119.24 (16)$ $C11'-C10'-C2'$ $120.30 (16)$ $C7-C8-C1$ $124.44 (16)$ $C15'-C10'-C2'$ $122.51 (17)$ $C9-C8-C1$ $116.31 (15)$ $C10'-C11'-C12'$ $121.42 (18)$ $C8-C9-C4$ $118.37 (18)$ $C10'-C11'-H11'$ $116.7 (10)$ $C8-C9-C3$ $118.91 (16)$ $C12'-C11'-H11'$ $121.9 (10)$ $C4-C9-C3$ $122.71 (18)$ $C13'-C12'-C11'$ $120.2 (2)$ $C11-C10-C15$ $117.55 (18)$ $C13'-C12'-H12'$ $121.5 (12)$ $C11-C10-C2$ $120.17 (16)$ $C11'-C12'-H12'$ $118.2 (12)$	C6-C7-C8 $120.42 (19)$ $C8'-C9'-C3'$ 118.5 $C6-C7-H7$ $120.1 (10)$ $C4'-C9'-C3'$ 122.5 $C8-C7-H7$ $119.4 (10)$ $C11'-C10'-C15'$ 117.1 $C7-C8-C9$ $119.24 (16)$ $C11'-C10'-C2'$ 120.3 $C7-C8-C1$ $124.44 (16)$ $C15'-C10'-C2'$ 122.5 $C9-C8-C1$ $116.31 (15)$ $C10'-C11'-C12'$ 121.4 $C8-C9-C4$ $118.37 (18)$ $C10'-C11'-H11'$ 116.7 $C8-C9-C3$ $122.71 (18)$ $C12'-C11'-H11'$ 121.5 $C11-C10-C15$ $117.55 (18)$ $C13'-C12'-H12'$ 121.5 $C15-C10-C2$ $122.27 (17)$ $C12'-C13'-H12'$ 118.27 $C12-C11-C10$ $121.6 (2)$ $C12'-C13'-H13'$ 119.17 $C12-C11-H11$ $122.8 (10)$ $C14'-C13'-H13'$ 122.5 $C10-C11-H11$ $125.6 (10)$ $C13'-C14'-C15'$ 120.5	С5—С6—Н6	120.4 (12)	C8'—C9'—C4'	118.12 (19)
C6—C7—H7120.1 (10) $C4'-C9'-C3'$ 122.94 (18)C8—C7—H7119.4 (10) $C11'-C10'-C15'$ 117.18 (17)C7—C8—C9119.24 (16) $C11'-C10'-C2'$ 120.30 (16)C7—C8—C1124.44 (16) $C15'-C10'-C2'$ 122.51 (17)C9—C8—C1116.31 (15) $C10'-C11'-C12'$ 121.42 (18)C8—C9—C4118.37 (18) $C10'-C11'-H11'$ 116.7 (10)C8—C9—C3118.91 (16) $C12'-C11'-H11'$ 121.9 (10)C4—C9—C3122.71 (18) $C13'-C12'-C11'$ 120.2 (2)C11—C10—C15117.55 (18) $C13'-C12'-H12'$ 121.5 (12)C11—C10—C2120.17 (16) $C11'-C12'-H12'$ 118.2 (12)	C6—C7—H7120.1 (10)C4'—C9'—C3'122.9C8—C7—H7119.4 (10)C11'—C10'—C15'117.1C7—C8—C9119.24 (16)C11'—C10'—C2'120.2C7—C8—C1124.44 (16)C15'—C10'—C2'122.5C9—C8—C1116.31 (15)C10'—C11'—C12'121.4C8—C9—C4118.37 (18)C10'—C11'—H11'116.7C8—C9—C3118.91 (16)C12'—C11'—H11'121.5C11—C10—C15117.55 (18)C13'—C12'—C11'120.2C11—C10—C2120.17 (16)C11'—C12'—H12'118.2C15—C10—C2122.27 (17)C12'—C13'—C14'119.1C12—C11—C10121.6 (2)C12'—C13'—H13'119.1C12—C11—H11122.8 (10)C14'—C13'—H13'121.8C10—C11—H11115.6 (10)C13'—C14'—C15'120.5	C6—C7—C8	120.42 (19)	C8'—C9'—C3'	118.93 (16)
C8—C7—H7119.4 (10)C11'—C10'—C15'117.18 (17)C7—C8—C9119.24 (16)C11'—C10'—C2'120.30 (16)C7—C8—C1124.44 (16)C15'—C10'—C2'122.51 (17)C9—C8—C1116.31 (15)C10'—C11'—C12'121.42 (18)C8—C9—C4118.37 (18)C10'—C11'—H11'116.7 (10)C8—C9—C3118.91 (16)C12'—C11'—H11'121.9 (10)C4—C9—C3122.71 (18)C13'—C12'—C11'120.2 (2)C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C8-C7-H7 119.4 (10) $C11'-C10'-C15'$ 117.1 $C7-C8-C9$ 119.24 (16) $C11'-C10'-C2'$ 120.3 $C7-C8-C1$ 124.44 (16) $C15'-C10'-C2'$ 122.4 $C9-C8-C1$ 116.31 (15) $C10'-C11'-C12'$ 121.4 $C8-C9-C4$ 118.37 (18) $C10'-C11'-H11'$ 116.7 $C8-C9-C3$ 118.91 (16) $C12'-C11'-H11'$ 121.9 $C4-C9-C3$ 122.71 (18) $C13'-C12'-C11'$ 120.2 $C11-C10-C15$ 117.55 (18) $C13'-C12'-H12'$ 118.2 $C15-C10-C2$ 120.17 (16) $C11'-C12'-H12'$ 118.2 $C12-C11-C10$ 121.6 (2) $C12'-C13'-H13'$ 119.1 $C12-C11-H11$ 122.8 (10) $C14'-C13'-H13'$ 121.8 $C10-C11-H11$ 115.6 (10) $C13'-C14'-C15'$ 120.8	С6—С7—Н7	120.1 (10)	C4'—C9'—C3'	122.94 (18)
C7-C8-C9 $119.24 (16)$ $C11'-C10'-C2'$ $120.30 (16)$ $C7-C8-C1$ $124.44 (16)$ $C15'-C10'-C2'$ $122.51 (17)$ $C9-C8-C1$ $116.31 (15)$ $C10'-C11'-C12'$ $121.42 (18)$ $C8-C9-C4$ $118.37 (18)$ $C10'-C11'-H11'$ $116.7 (10)$ $C8-C9-C3$ $118.91 (16)$ $C12'-C11'-H11'$ $121.9 (10)$ $C4-C9-C3$ $122.71 (18)$ $C13'-C12'-C11'$ $120.2 (2)$ $C11-C10-C15$ $117.55 (18)$ $C13'-C12'-H12'$ $121.5 (12)$ $C11-C10-C2$ $120.17 (16)$ $C11'-C12'-H12'$ $118.2 (12)$	C7-C8-C9 $119.24 (16)$ $C11'-C10'-C2'$ 120.3 $C7-C8-C1$ $124.44 (16)$ $C15'-C10'-C2'$ 122.3 $C9-C8-C1$ $116.31 (15)$ $C10'-C11'-C12'$ 121.4 $C8-C9-C4$ $118.37 (18)$ $C10'-C11'-H11'$ 116.7 $C8-C9-C3$ $118.91 (16)$ $C12'-C11'-H11'$ 121.5 $C4-C9-C3$ $122.71 (18)$ $C13'-C12'-C11'$ 120.2 $C11-C10-C15$ $117.55 (18)$ $C13'-C12'-H12'$ 121.5 $C15-C10-C2$ $120.17 (16)$ $C11'-C12'-H12'$ 118.2 $C15-C10-C2$ $122.27 (17)$ $C12'-C13'-C14'$ 119.1 $C12-C11-C10$ $121.6 (2)$ $C12'-C13'-H13'$ 119.1 $C12-C11-H11$ $122.8 (10)$ $C14'-C13'-H13'$ 121.8 $C10-C11-H11$ $115.6 (10)$ $C13'-C14'-C15'$ 120.5	С8—С7—Н7	119.4 (10)	C11'—C10'—C15'	117.18 (17)
C7—C8—C1 124.44 (16) C15'—C10'—C2' 122.51 (17) C9—C8—C1 116.31 (15) C10'—C11'—C12' 121.42 (18) C8—C9—C4 118.37 (18) C10'—C11'—H11' 116.7 (10) C8—C9—C3 118.91 (16) C12'—C11'—H11' 121.9 (10) C4—C9—C3 122.71 (18) C13'—C12'—C11' 120.2 (2) C11—C10—C15 117.55 (18) C13'—C12'—H12' 121.5 (12) C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 (12)	C7-C8-C1 124.44 (16) $C15'-C10'-C2'$ 122.5 $C9-C8-C1$ 116.31 (15) $C10'-C11'-C12'$ 121.4 $C8-C9-C4$ 118.37 (18) $C10'-C11'-H11'$ 116.7 $C8-C9-C3$ 118.91 (16) $C12'-C11'-H11'$ 121.9 $C4-C9-C3$ 122.71 (18) $C13'-C12'-C11'$ 120.2 $C11-C10-C15$ 117.55 (18) $C13'-C12'-H12'$ 121.5 $C15-C10-C2$ 120.17 (16) $C11'-C12'-H12'$ 118.2 $C15-C10-C2$ 122.27 (17) $C12'-C13'-C14'$ 119.1 $C12-C11-C10$ 121.6 (2) $C12'-C13'-H13'$ 119.1 $C12-C11-H11$ 122.8 (10) $C14'-C13'-H13'$ 121.6 $C10-C11-H11$ 115.6 (10) $C13'-C14'-C15'$ 120.8	C7—C8—C9	119.24 (16)	C11'—C10'—C2'	120.30 (16)
C9—C8—C1 116.31 (15) C10'—C11'—C12' 121.42 (18) C8—C9—C4 118.37 (18) C10'—C11'—H11' 116.7 (10) C8—C9—C3 118.91 (16) C12'—C11'—H11' 121.9 (10) C4—C9—C3 122.71 (18) C13'—C12'—C11' 120.2 (2) C11—C10—C15 117.55 (18) C13'—C12'—H12' 121.5 (12) C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 (12)	C9—C8—C1116.31 (15)C10'—C11'—C12'121.4C8—C9—C4118.37 (18)C10'—C11'—H11'116.7C8—C9—C3118.91 (16)C12'—C11'—H11'121.9C4—C9—C3122.71 (18)C13'—C12'—C11'120.2C11—C10—C15117.55 (18)C13'—C12'—H12'121.5C15—C10—C2120.17 (16)C11'—C12'—H12'118.2C12—C11—C10121.6 (2)C12'—C13'—C14'119.1C12—C11—H11122.8 (10)C14'—C13'—H13'121.8C10—C11—H11115.6 (10)C13'—C14'—C15'120.8	C7—C8—C1	124.44 (16)	C15'—C10'—C2'	122.51 (17)
C8—C9—C4 118.37 (18) C10'—C11'—H11' 116.7 (10) C8—C9—C3 118.91 (16) C12'—C11'—H11' 121.9 (10) C4—C9—C3 122.71 (18) C13'—C12'—C11' 120.2 (2) C11—C10—C15 117.55 (18) C13'—C12'—H12' 121.5 (12) C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 (12)	C8-C9-C4 $118.37 (18)$ $C10'-C11'-H11'$ 116.7 $C8-C9-C3$ $118.91 (16)$ $C12'-C11'-H11'$ 121.9 $C4-C9-C3$ $122.71 (18)$ $C13'-C12'-C11'$ 120.2 $C11-C10-C15$ $117.55 (18)$ $C13'-C12'-H12'$ 121.5 $C11-C10-C2$ $120.17 (16)$ $C11'-C12'-H12'$ 118.2 $C15-C10-C2$ $122.27 (17)$ $C12'-C13'-C14'$ 119.1 $C12-C11-C10$ $121.6 (2)$ $C12'-C13'-H13'$ 119.1 $C12-C11-H11$ $122.8 (10)$ $C14'-C13'-H13'$ 121.8 $C10-C11-H11$ $115.6 (10)$ $C13'-C14'-C15'$ 120.8	C9—C8—C1	116.31 (15)	C10'—C11'—C12'	121.42 (18)
C8—C9—C3 118.91 (16) C12'—C11'—H11' 121.9 (10) C4—C9—C3 122.71 (18) C13'—C12'—C11' 120.2 (2) C11—C10—C15 117.55 (18) C13'—C12'—H12' 121.5 (12) C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 (12)	C8-C9-C3 118.91 (16) $C12'-C11'-H11'$ 121.9 $C4-C9-C3$ 122.71 (18) $C13'-C12'-C11'$ 120.7 $C11-C10-C15$ 117.55 (18) $C13'-C12'-H12'$ 121.5 $C11-C10-C2$ 120.17 (16) $C11'-C12'-H12'$ 118.2 $C15-C10-C2$ 122.27 (17) $C12'-C13'-C14'$ 119.1 $C12-C11-C10$ 121.6 (2) $C12'-C13'-H13'$ 119.1 $C12-C11-H11$ 122.8 (10) $C14'-C13'-H13'$ 121.6 $C10-C11-H11$ 115.6 (10) $C13'-C14'-C15'$ 120.8	C8—C9—C4	118.37 (18)	C10'—C11'—H11'	116.7 (10)
C4—C9—C3122.71 (18)C13'—C12'—C11'120.2 (2)C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C4-C9-C3 122.71 (18) C13'-C12'-C11' 120.7 C11-C10-C15 117.55 (18) C13'-C12'-H12' 121.5 C11-C10-C2 120.17 (16) C11'-C12'-H12' 118.2 C15-C10-C2 122.27 (17) C12'-C13'-C14' 119.1 C12-C11-C10 121.6 (2) C12'-C13'-H13' 119.1 C12-C11-H11 122.8 (10) C14'-C13'-H13' 121.8 C10-C11-H11 115.6 (10) C13'-C14'-C15' 120.8	C8—C9—C3	118.91 (16)	C12'—C11'—H11'	121.9 (10)
C11—C10—C15117.55 (18)C13'—C12'—H12'121.5 (12)C11—C10—C2120.17 (16)C11'—C12'—H12'118.2 (12)	C11—C10—C15 117.55 (18) C13'—C12'—H12' 121.5 C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 C15—C10—C2 122.27 (17) C12'—C13'—C14' 119.1 C12—C11—C10 121.6 (2) C12'—C13'—H13' 119.1 C12—C11—H11 122.8 (10) C14'—C13'—H13' 121.8 C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8	C4—C9—C3	122.71 (18)	C13'—C12'—C11'	120.2 (2)
C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 (12)	C11—C10—C2 120.17 (16) C11'—C12'—H12' 118.2 C15—C10—C2 122.27 (17) C12'—C13'—C14' 119.1 C12—C11—C10 121.6 (2) C12'—C13'—H13' 119.1 C12—C11—H11 122.8 (10) C14'—C13'—H13' 121.8 C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8	C11—C10—C15	117.55 (18)	C13'—C12'—H12'	121.5 (12)
	C15—C10—C2 122.27 (17) C12'—C13'—C14' 119.1 C12—C11—C10 121.6 (2) C12'—C13'—H13' 119.1 C12—C11—H11 122.8 (10) C14'—C13'—H13' 121.8 C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8	C11—C10—C2	120.17 (16)	C11'—C12'—H12'	118.2 (12)
C15—C10—C2 122.27 (17) C12'—C13'—C14' 119.1 (2)	C12—C11—C10 121.6 (2) C12'—C13'—H13' 119.1 C12—C11—H11 122.8 (10) C14'—C13'—H13' 121.8 C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8	C15—C10—C2	122.27 (17)	C12'—C13'—C14'	119.1 (2)
C12—C11—C10 121.6 (2) C12'—C13'—H13' 119.1 (12)	C12—C11—H11 122.8 (10) C14'—C13'—H13' 121.8 C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8	C12—C11—C10	121.6 (2)	C12'—C13'—H13'	119.1 (12)
C12—C11—H11 122.8 (10) C14'—C13'—H13' 121.8 (12)	C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8	C12—C11—H11	122.8 (10)	C14'—C13'—H13'	121.8 (12)
C10—C11—H11 115.6 (10) C13'—C14'—C15' 120.8 (2)		С10—С11—Н11	115.6 (10)	C13'—C14'—C15'	120.8 (2)
	C13—C12—C11 120.0 (2) C13'—C14'—H14' 120.1	C13—C12—C11	120.0 (2)	C13'—C14'—H14'	120.1 (12)

C13—C12—H12	121.3 (12)	C15'—C14'—H14'		119.1 (12)
C11—C12—H12	118.6 (12)	C14'—C15'—C10'		121.3 (2)
C12—C13—C14	119.8 (2)	С14'—С15'—Н15'		119.9 (11)
C12—C13—H13	119.3 (13)	C10'—C15'—H15'		118.8 (11)
C2—N1—C1—N2	179.67 (14)	C2'—N1'—C1'—N2'		-179.00 (14)
C2—N1—C1—C8	-1.7 (2)	C2'—N1'—C1'—C8'		1.6 (2)
N3—N2—C1—N1	-14.0 (2)	N3'—N2'—C1'—N1'		14.0 (2)
N3—N2—C1—C8	167.31 (15)	N3'—N2'—C1'—C8'		-166.61 (15)
C1—N1—C2—C3	0.4 (2)	C1'—N1'—C2'—C3'		0.5 (2)
C1—N1—C2—C10	-179.08 (13)	C1'—N1'—C2'—C10'		179.06 (14)
N1—C2—C3—C9	0.7 (3)	N1'—C2'—C3'—C9'		-1.5 (3)
C10—C2—C3—C9	-179.86 (15)	C10'—C2'—C3'—C9'		-179.91 (15)
C9—C4—C5—C6	-0.6 (4)	C9'—C4'—C5'—C6'		0.1 (4)
C4—C5—C6—C7	-0.1 (4)	C4'—C5'—C6'—C7'		-0.7 (4)
C5—C6—C7—C8	0.2 (3)	C5'—C6'—C7'—C8'		1.1 (3)
C6—C7—C8—C9	0.3 (3)	C6'—C7'—C8'—C9'		-0.9 (3)
C6—C7—C8—C1	-178.62 (17)	C6'—C7'—C8'—C1'		176.68 (18)
N1—C1—C8—C7	-179.17 (15)	N1'—C1'—C8'—C9'		-2.6 (2)
N2-C1-C8-C7	-0.6 (2)	N2'—C1'—C8'—C9'		177.99 (15)
N1—C1—C8—C9	1.9 (2)	N1'—C1'—C8'—C7'		179.72 (16)
N2-C1-C8-C9	-179.52 (14)	N2'—C1'—C8'—C7'		0.3 (2)
C7—C8—C9—C4	-0.9 (3)	C7'—C8'—C9'—C4'		0.3 (3)
C1—C8—C9—C4	178.12 (17)	C1'—C8'—C9'—C4'		-177.49 (17)
C7—C8—C9—C3	-179.72 (16)	C7'—C8'—C9'—C3'		179.33 (17)
C1—C8—C9—C3	-0.7 (2)	C1'—C8'—C9'—C3'		1.6 (2)
C5—C4—C9—C8	1.0 (3)	C5'—C4'—C9'—C8'		0.1 (3)
C5—C4—C9—C3	179.8 (2)	C5'—C4'—C9'—C3'		-178.9 (2)
C2—C3—C9—C8	-0.5 (3)	C2'—C3'—C9'—C8'		0.4 (3)
C2—C3—C9—C4	-179.28 (18)	C2'—C3'—C9'—C4'		179.37 (19)
C3—C2—C10—C11	-175.55 (17)	C3'—C2'—C10'—C11'		169.50 (17)
N1-C2-C10-C11	3.9 (2)	N1'—C2'—C10'—C11'		-9.0 (2)
C3—C2—C10—C15	4.8 (3)	C3'—C2'—C10'—C15'		-11.0 (3)
N1—C2—C10—C15	-175.73 (15)	N1'—C2'—C10'—C15'		170.47 (15)
C15-C10-C11-C12	0.4 (3)	C15'—C10'—C11'—C12	•	0.5 (3)
C2-C10-C11-C12	-179.27 (16)	C2'—C10'—C11'—C12'		180.00 (16)
C10-C11-C12-C13	0.1 (3)	C10'—C11'—C12'—C13	•	-0.4 (3)
C11—C12—C13—C14	-0.3 (3)	C11'—C12'—C13'—C14	'	0.1 (3)
C12—C13—C14—C15	0.1 (3)	C12'—C13'—C14'—C15		0.3 (3)
C13-C14-C15-C10	0.4 (3)	C13'—C14'—C15'—C10	,	-0.2 (3)
C11—C10—C15—C14	-0.6 (3)	C11'—C10'—C15'—C14	'	-0.2 (3)
C2-C10-C15-C14	179.05 (16)	C2'—C10'—C15'—C14'		-179.68 (16)
Hydrogen-bond geometry (Å, °)				
D—H…A	<i>D</i> —Н	H···A	$D \cdots A$	D—H···A
N2'—H2'N…N3' ⁱ	0.91 (2)	2.15 (2)	2.967 (2)	151 (2)
N2—H2N···N3 ⁱⁱ	0.90 (2)	2.20 (2)	3.027 (2)	152 (2)
N3'—H3'B…N1' ⁱⁱⁱ	0.89 (2)	2.24 (2)	3.119 (2)	169 (2)

N3—H3A…N1^{iv} 0.92 (2) 2.26 (2) 3.170 (3) 168 (2) Symmetry codes: (i) -x, -y, -z; (ii) -x+1, -y, -z+1; (iii) -x+1, -y, -z; (iv) -x+2, -y, -z+1.

Fig. 1



