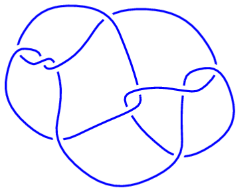
# $10_{128}$ ($K10n_{22}$)



[1]

**Arc Sequences**

$\to \downarrow_{5} \to \downarrow_{6} \to \downarrow_{7} \to \downarrow_{10} \to \downarrow_{3} \to \downarrow_{2} \to \downarrow_{10} \to \downarrow_{7} \to \downarrow_{4} \to \downarrow_{8} \to$

**Solving Sequence**

$$7{,}10 \xrightarrow[c_7]{} 8 \xrightarrow[c_8]{} 2{,}9 \xrightarrow[c_6]{} 6 \xrightarrow[c_2]{} 3 \xrightarrow[c_3]{} 4 \xrightarrow[c_5]{} 5 \xrightarrow[c_1]{} 1 \twoheadrightarrow c_4, c_9, c_{10}$$

**Representation Ideals**

$$I = \bigcap_{i=1}^{2} I_i^u$$

$$I_1^u = \langle u^3 - u^2 + 2u - 1,\ b + 1,\ u^2 + a - u + 2\rangle$$
$$I_2^u = \langle u^8 + 2u^7 + 5u^6 + 6u^5 + 7u^4 + 6u^3 + 2u^2 + u - 1,\ -u^6 - u^5 - 3u^4 - 2u^3 - 2u^2 + b - u + 1,\ -u^7 - 2u^6 - 4u^5 - 5u^4 - 4u^3 - 4u^2 + a\rangle$$

There are 2 irreducible components with 11 representations.

[1]The knot diagram image is adapter from "C. Livingston and A. H. Moore, KnotInfo: Table of Knot Invariants, http://www.indiana.edu/ knotinfo"

## I. $I_1^u = \langle u^3 - u^2 + 2u - 1,\ b + 1,\ u^2 + a - u + 2 \rangle$

**(i) Arc colorings**

$$a_7 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} -u^2 + u - 2 \\ -1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^2 + u - 2 \\ u - 1 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -u^2 + u - 2 \\ -1 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} u \\ u \end{pmatrix}$$
$$a_3 = \begin{pmatrix} u^2 + 1 \\ u^2 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} u^2 + 1 \\ u^2 - u + 1 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} u^2 + 1 \\ u^2 - u + 1 \end{pmatrix}$$
$$a_1 = \begin{pmatrix} 0 \\ -u \end{pmatrix}$$

**(ii) Obstruction class** $= 1$

**(iii) Cusp Shapes** $= -3u^2 + 4u - 16$

**(iv) Complex Volumes and Cusp Shapes**

| Solution to $I_1^u$ | $\sqrt{-1}(\text{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = \quad 0.215080 - 1.307141I$<br>$a = -0.122561 - 0.744862I$<br>$b = -1.00000$ | $1.37919 + 2.82812I$ | $-10.15260 - 3.54173I$ |
| $u = \quad 0.215080 + 1.307141I$<br>$a = -0.122561 + 0.744862I$<br>$b = -1.00000$ | $1.37919 - 2.82812I$ | $-10.15260 + 3.54173I$ |
| $u = \quad 0.569840$<br>$a = -1.75488$<br>$b = -1.00000$ | $-2.75839$ | $-14.6948$ |

**II.** $\boldsymbol{I_2^u = \langle u^8 + 2u^7 + \cdots + u - 1,\ -u^6 - u^5 - 3u^4 - 2u^3 - 2u^2 + b - u + 1,\ -u^7 - 2u^6 - 4u^5 - 5u^4 - 4u^3 - 4u^2 + a\rangle}$

**(i) Arc colorings**

$$a_7 = \begin{pmatrix} 0 \\ u \end{pmatrix}$$
$$a_{10} = \begin{pmatrix} u^7 + 2u^6 + 4u^5 + 5u^4 + 4u^3 + 4u^2 \\ u^6 + u^5 + 3u^4 + 2u^3 + 2u^2 + u - 1 \end{pmatrix}$$
$$a_8 = \begin{pmatrix} -u^7 - 2u^6 - 5u^5 - 5u^4 - 6u^3 - 4u^2 - u + 1 \\ -u^5 - u^4 - 2u^3 - u^2 - u + 1 \end{pmatrix}$$
$$a_2 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$a_9 = \begin{pmatrix} -u^7 - 2u^6 - 5u^5 - 5u^4 - 6u^3 - 4u^2 - u + 1 \\ u^6 + u^4 - u^3 + u^2 - 2u + 1 \end{pmatrix}$$
$$a_6 = \begin{pmatrix} u \\ u \end{pmatrix}$$
$$a_3 = \begin{pmatrix} u^2 + 1 \\ u^2 \end{pmatrix}$$
$$a_4 = \begin{pmatrix} u^2 + 1 \\ u^4 + 2u^2 \end{pmatrix}$$
$$a_5 = \begin{pmatrix} u^3 + 2u \\ u^3 + u \end{pmatrix}$$
$$a_1 = \begin{pmatrix} -u^6 - 3u^4 - 2u^2 + 1 \\ -u^6 - 2u^4 - u^2 \end{pmatrix}$$

**(ii) Obstruction class** $= -1$

**(iii) Cusp Shapes** $= u^7 + 2u^6 + 4u^5 + 2u^4 - 3u^2 - 4u - 13$

### (iv) Complex Volumes and Cusp Shapes

| Solution to $I_2^u$ | $\sqrt{-1}(\mathrm{vol} + \sqrt{-1}CS)$ | Cusp shape |
|---|---|---|
| $u = -1.09831$<br>$a = 1.99128$<br>$b = 2.18705$ | $-18.5039$ | $-14.1254$ |
| $u = -0.55241 - 1.37610I$<br>$a = 0.67353 - 1.24743I$<br>$b = 2.08865 + 0.23775I$ | $-14.2177 - 5.8605I$ | $-11.51154 + 2.72065I$ |
| $u = -0.55241 + 1.37610I$<br>$a = 0.67353 + 1.24743I$<br>$b = 2.08865 - 0.23775I$ | $-14.2177 + 5.8605I$ | $-11.51154 - 2.72065I$ |
| $u = -0.271970 - 0.836396I$<br>$a = -0.86660 + 1.21427I$<br>$b = -1.251302 - 0.394571I$ | $-1.14011 - 1.32248I$ | $-11.15537 + 1.48485I$ |
| $u = -0.271970 + 0.836396I$<br>$a = -0.86660 - 1.21427I$<br>$b = -1.251302 + 0.394571I$ | $-1.14011 + 1.32248I$ | $-11.15537 - 1.48485I$ |
| $u = 0.198501 - 1.220550I$<br>$a = 0.316290 - 0.217397I$<br>$b = 0.202560 + 0.429200I$ | $2.74105 + 2.12062I$ | $-5.41411 - 2.85603I$ |
| $u = 0.198501 + 1.220550I$<br>$a = 0.316290 + 0.217397I$<br>$b = 0.202560 - 0.429200I$ | $2.74105 - 2.12062I$ | $-5.41411 + 2.85603I$ |
| $u = 0.350076$<br>$a = 0.762278$<br>$b = -0.266855$ | $-0.675825$ | $-14.7126$ |

## III. u-Polynomials

| Crossings | u-Polynomials at each crossings |
|---|---|
| $c_1, c_3$ | $(u^3+u^2-1)(u^8+2u^7-7u^6-12u^5+7u^4+2u^3-2u^2-3u-1)$ |
| $c_2$ | $(u^3-u^2+2u-1)(u^8+2u^7+5u^6+6u^5+7u^4+6u^3+2u^2+u-1)$ |
| $c_4, c_9$ | $u^3(u^8+u^7-10u^6-7u^5+19u^4-23u^3-12u+8)$ |
| $c_5, c_6$ | $(u^3+u^2+2u+1)(u^8+2u^7+5u^6+6u^5+7u^4+6u^3+2u^2+u-1)$ |
| $c_7$ | $(u-1)^3(u^8+4u^7-13u^5-3u^4+15u^3+3u^2+2u-1)$ |
| $c_8$ | $(u+1)^3$<br>$(u^8+16u^7+98u^6+283u^5+381u^4+191u^3-45u^2+10u+1)$ |
| $c_{10}$ | $(u+1)^3(u^8+4u^7-13u^5-3u^4+15u^3+3u^2+2u-1)$ |

## IV. Riley Polynomials

| Crossings | Riley Polynomials at each crossings |
|---|---|
| $c_1, c_3$ | $(y^3 - y^2 + 2y - 1)$<br>$(y^8 - 18y^7 + 111y^6 - 254y^5 + 135y^4 - 90y^3 + 2y^2 - 5y + 1)$ |
| $c_2, c_5, c_6$ | $(y^3 + 3y^2 + 2y - 1)$<br>$(y^8 + 6y^7 + 15y^6 + 14y^5 - 9y^4 - 30y^3 - 22y^2 - 5y + 1)$ |
| $c_4, c_9$ | $y^3(y^8 - 21y^7 + \cdots - 144y + 64)$ |
| $c_7, c_{10}$ | $(y - 1)^3$<br>$(y^8 - 16y^7 + 98y^6 - 283y^5 + 381y^4 - 191y^3 - 45y^2 - 10y + 1)$ |
| $c_8$ | $(y - 1)^3(y^8 - 60y^7 + \cdots - 190y + 1)$ |