

長野県林業総合センター 塩尻市片丘 5739
 Nagano-prefectural Forestry Research Center
 TEL 0263-52-0600 FAX 0263-51-1311

長野県産カラマツラミナ推定強度早見表

キーワード: ラミナ、集成材、強度分布

1 カラマツラミナの強度推定

近年、松本ら¹⁾が提案したモデル式によりラミナのヤング係数が推定可能になりましたので、大径材利用促進のためラミナ推定強度早見表を作成しました。推定対象のカラマツ大径丸太は末口直径30cmから60cmとし、ラミナ断面寸法は幅120mm厚さ40mmとしました。なお、モデル式の値については木曽郡産カラマツ丸太10本分の試験結果より $a = 0.0592$ 、 $b = 0.0187$ 、 $B = 86$ とし、距離を決定するため加藤らが考案した0.5mm間隔の点群法²⁾を用いました。

ラミナ着色の凡例は右図のとおりです。

凡例

| |
|--------|
| L80以下 |
| L90 |
| L100 |
| L110 |
| L125 |
| L140以上 |

2 早見表使用上の注意

丸太のヤング係数区分内で本来変動のあるヤング係数について、今回は代表的な値（Ef90 ; 9.00 kN/mm²、Ef110 ; 11.00 kN/mm²、Ef130 ; 13.00 kN/mm²、Ef150 ; 15.00 kN/mm²）のみを用いて推定しているため、同じ Ef 等級の丸太であっても平均より低いヤング係数の丸太から採材した場合ラミナ等級は下がる可能性があります。

また今回計算されたラミナのヤング係数推定値は動的ヤング係数の一種である縦振動ヤング係数ですが、ラミナの抜き取り試験時には静的曲げ試験で曲げヤング係数を確認することとなっています³⁾。一般に動的ヤング係数は静的ヤング係数より 5~10%程度大きな値を示す⁴⁾点に注意が必要です。本早見表の現場への適用にあたっては、あくまで目安程度にお考え下さい。

引用文献

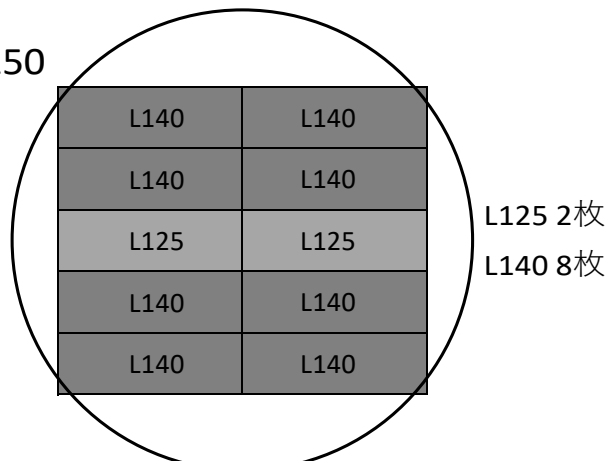
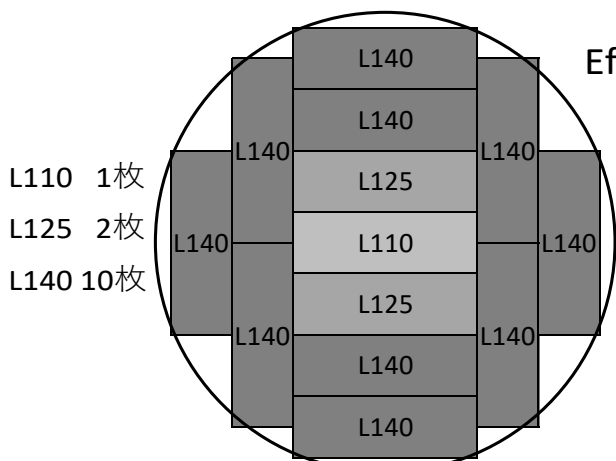
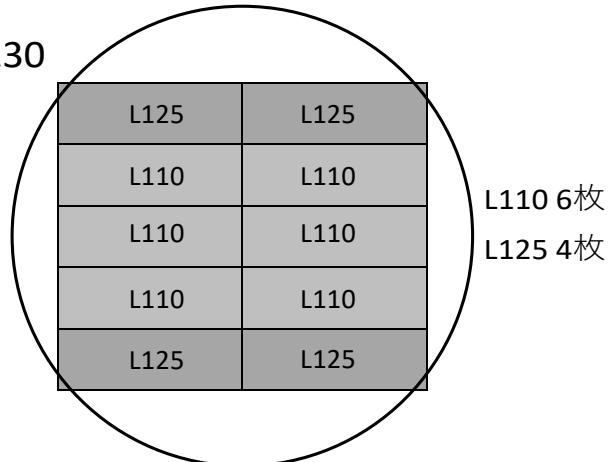
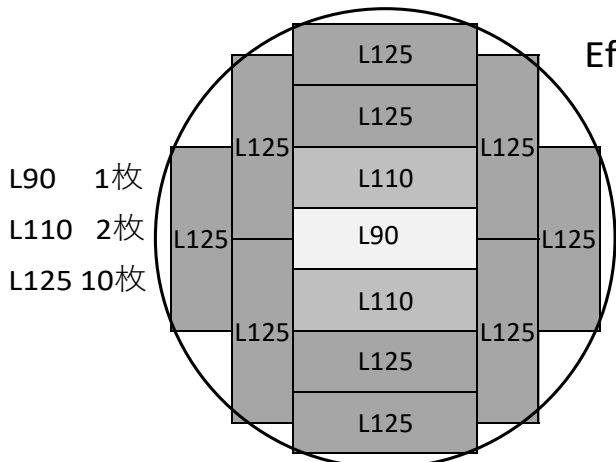
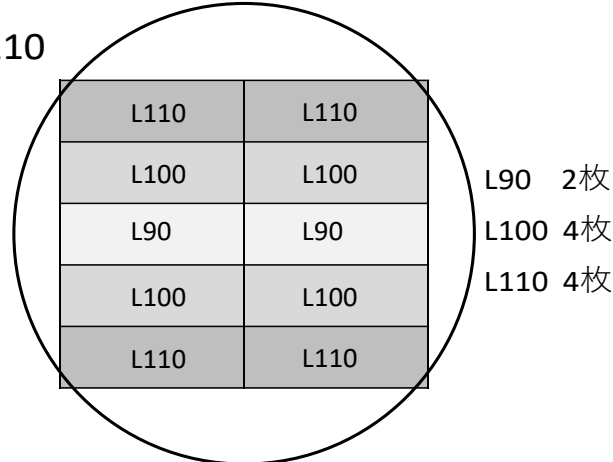
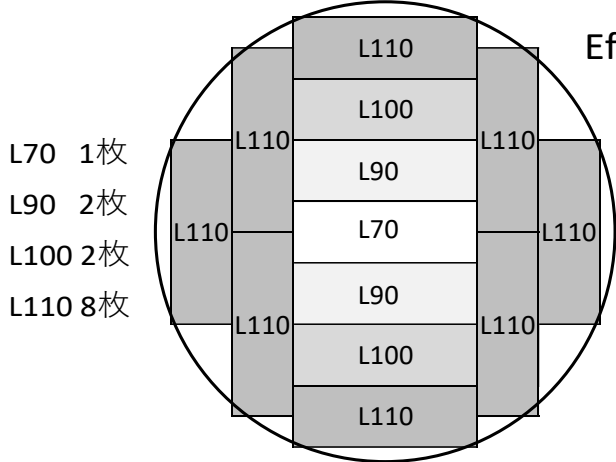
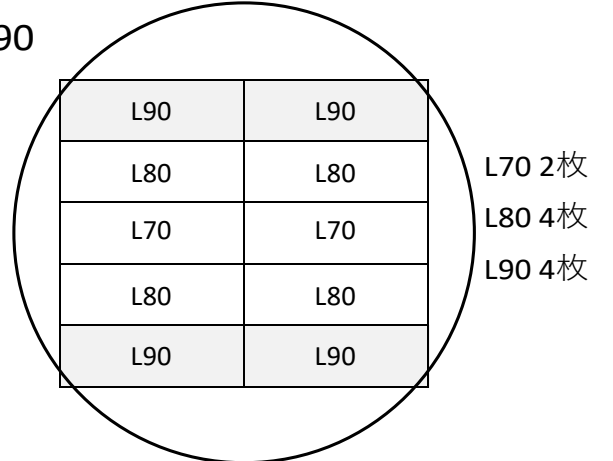
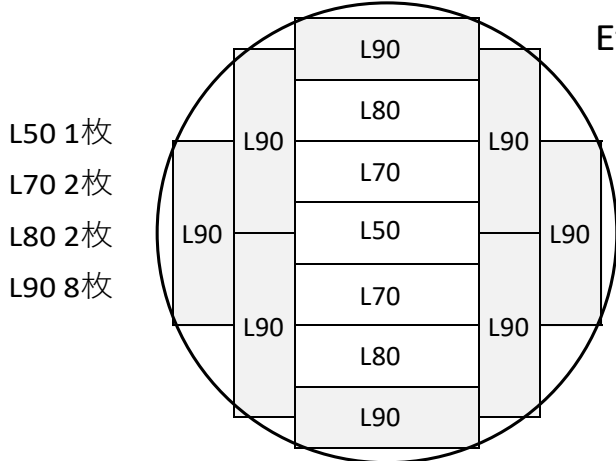
1)松本和茂ほか5名(2021) 丸太段階で製材品のヤング係数を推定する技術の開発(カラマツ・トドマツ)、森林総合研究所編「大径材の使い方」、19-20 2)加藤英雄・長尾博文(2021) 混合木取りで採材したスギ製材品の縦振動法によるヤング係数の推定、木材工業、76、11、484-487 3) 農林水産省、集成材の日本農林規格、農林水産省告示第1152号(平成19年9月25日制定)、農林水産省告示897号(令和5年7月31日改正) 4) (公財)日本住宅・木材技術センター(2011) 構造用木材の強度試験マニュアル、162pp

担当者 木材部 小池直樹

φ30~32cm

心持ち採材ラミナ全13枚

心去り採材ラミナ全10枚

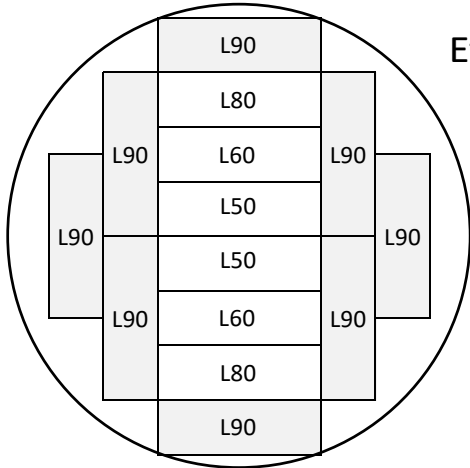


φ34cm

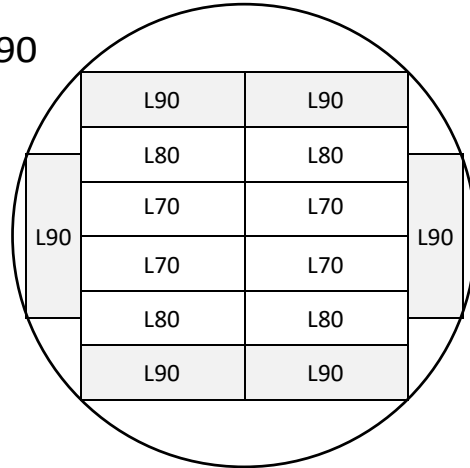
心持ち採材ラミナ全14枚

心去り採材ラミナ全14枚

L50 2枚
L60 2枚
L80 2枚
L90 8枚

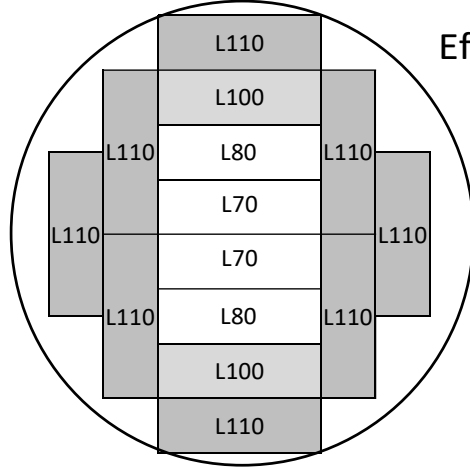


Ef90

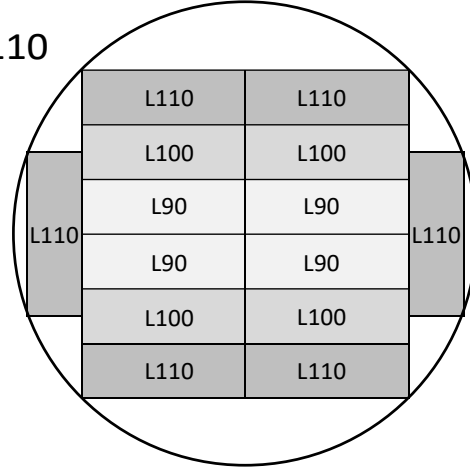


L70 4枚
L80 4枚
L90 6枚

L70 2枚
L80 2枚
L100 2枚
L110 8枚

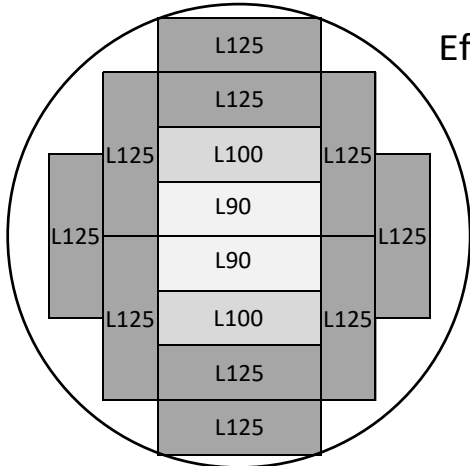


Ef110

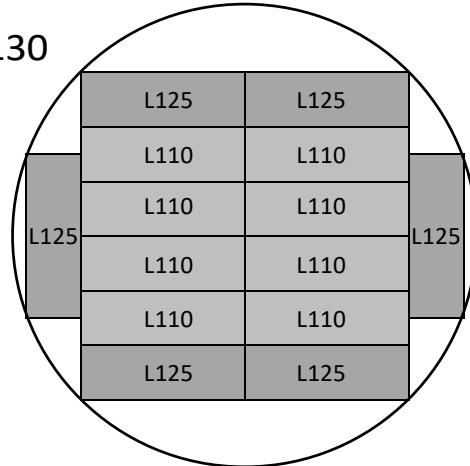


L90 4枚
L100 4枚
L110 6枚

L90 2枚
L100 2枚
L125 10枚

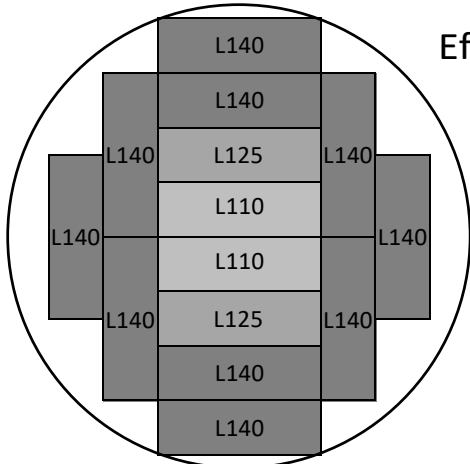


Ef130

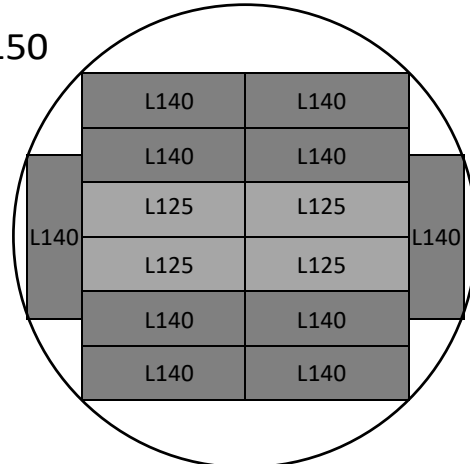


L110 8枚
L125 6枚

L110 2枚
L125 2枚
L140 10枚



Ef150



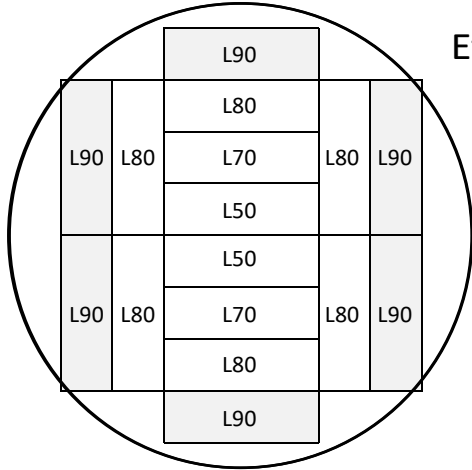
L125 4枚
L140 10枚

φ36cm

心持ち採材ラミナ全16枚

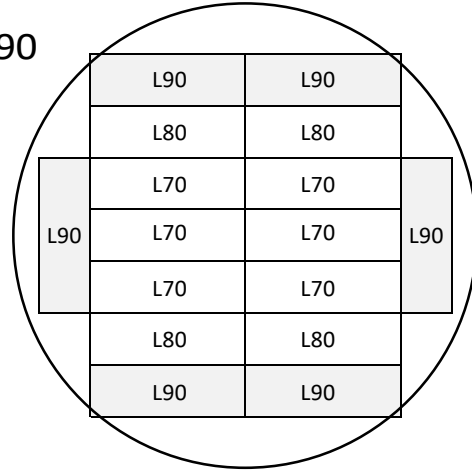
心去り採材ラミナ全16枚

L50 2枚
L70 2枚
L80 6枚
L90 6枚

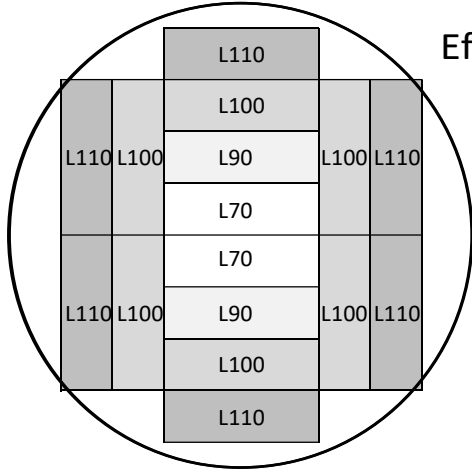


Ef90

L70 6枚
L80 4枚
L90 6枚

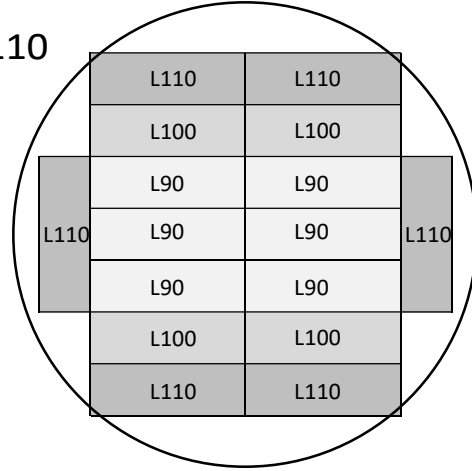


L70 2枚
L90 2枚
L100 6枚
L110 6枚

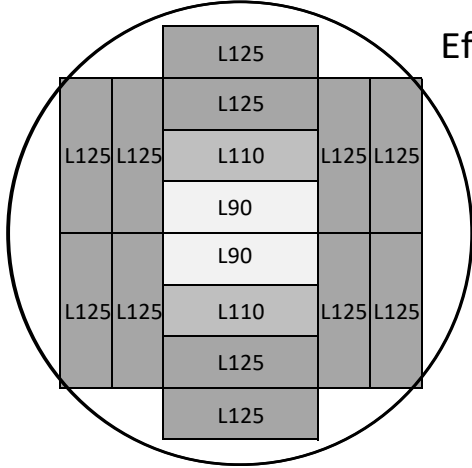


Ef110

L90 6枚
L100 4枚
L110 6枚

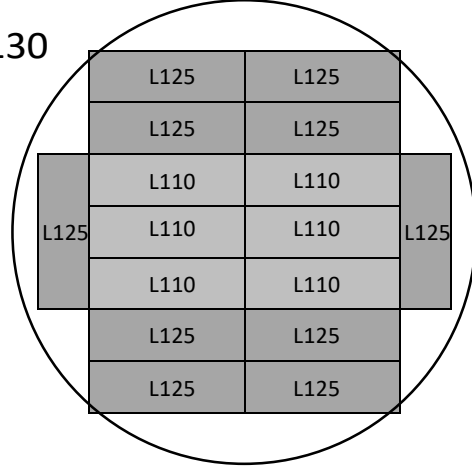


L90 2枚
L110 2枚
L125 12枚

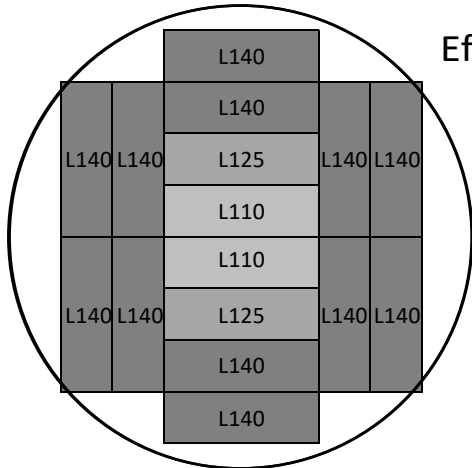


Ef130

L110 6枚
L125 10枚

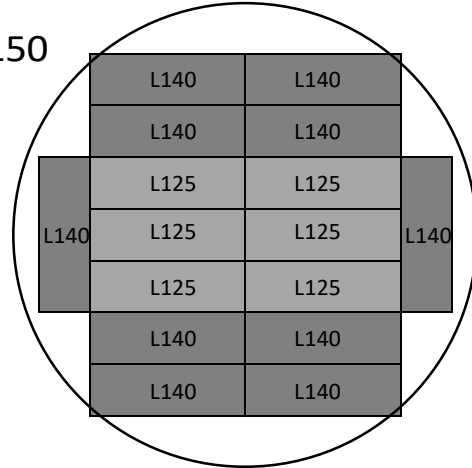


L110 2枚
L125 2枚
L140 12枚



Ef150

L125 6枚
L140 10枚

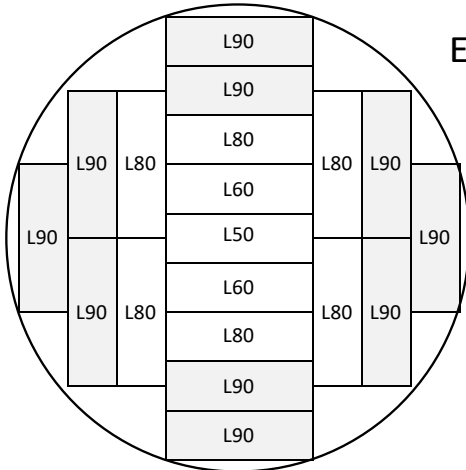


φ38cm

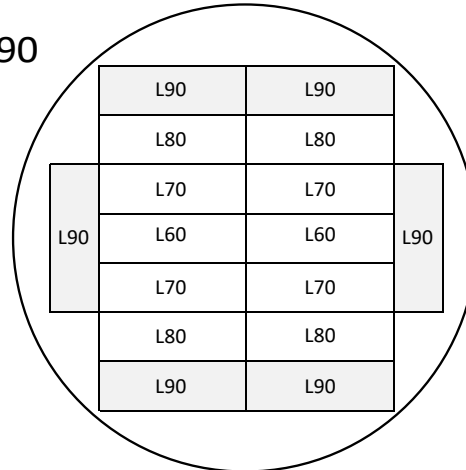
心持ち採材ラミナ全19枚

心去り採材ラミナ全16枚

L50 1枚
L60 2枚
L80 6枚
L90 10枚

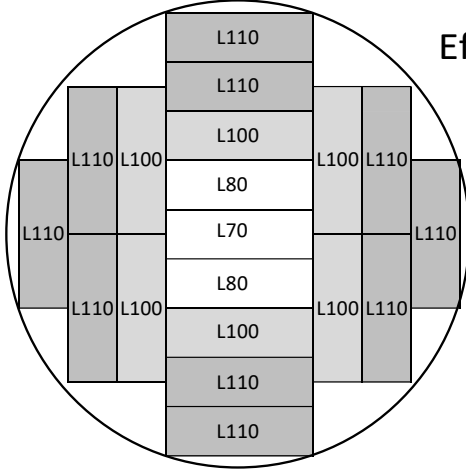


Ef90

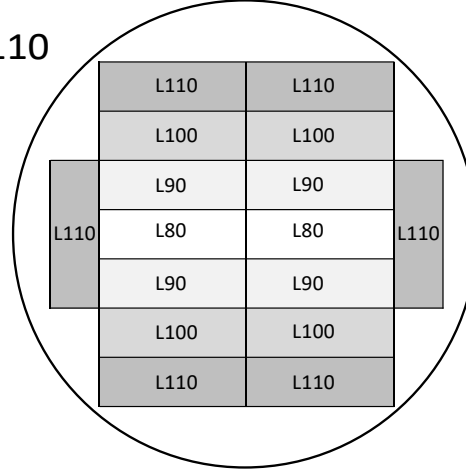


L60 2枚
L70 4枚
L80 4枚
L90 6枚

L70 1枚
L80 2枚
L100 6枚
L110 10枚

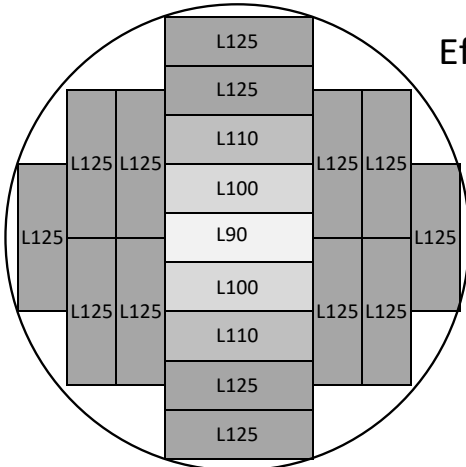


Ef110

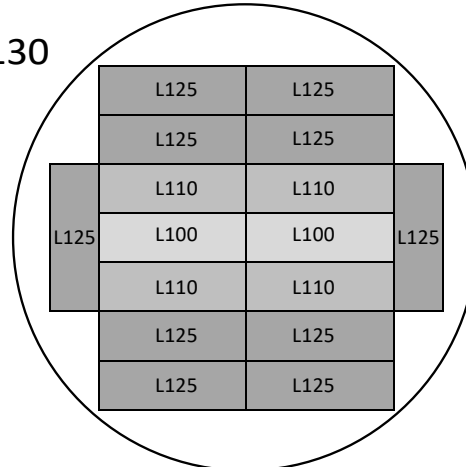


L80 2枚
L90 4枚
L100 4枚
L110 6枚

L90 1枚
L100 2枚
L110 2枚
L125 14枚

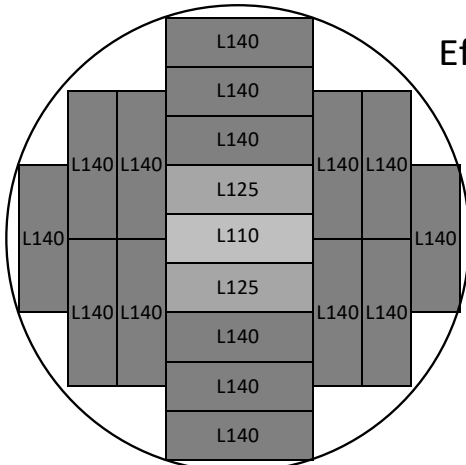


Ef130

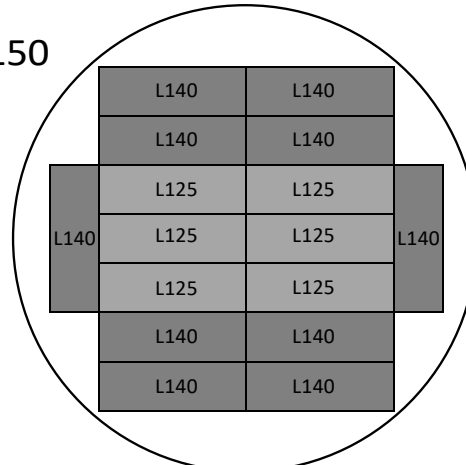


L100 2枚
L110 4枚
L125 10枚

L110 1枚
L125 2枚
L140 16枚



Ef150



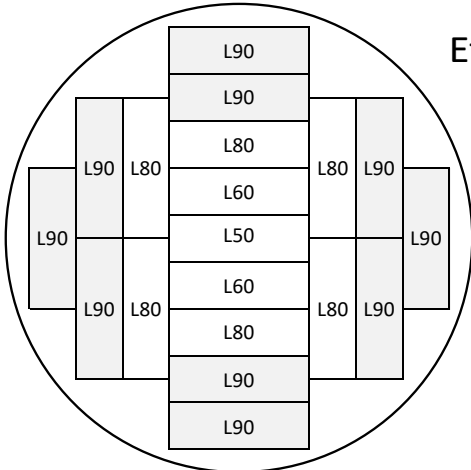
L125 6枚
L140 10枚

φ40cm

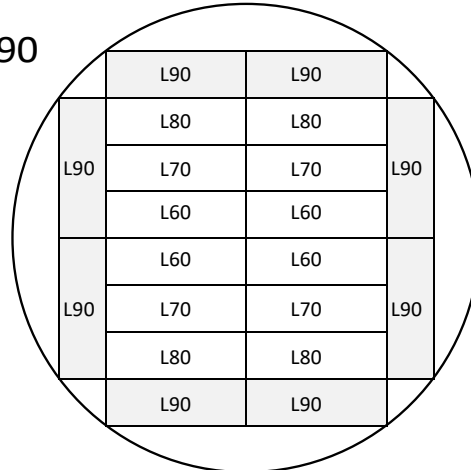
心持ち採材ラミナ全19枚

心去り採材ラミナ全20枚

L50 1枚
L60 2枚
L80 6枚
L90 10枚

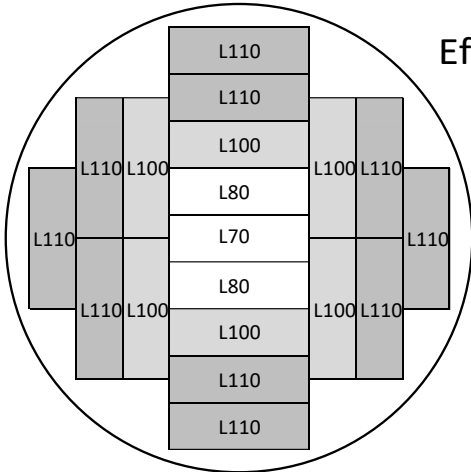


Ef90

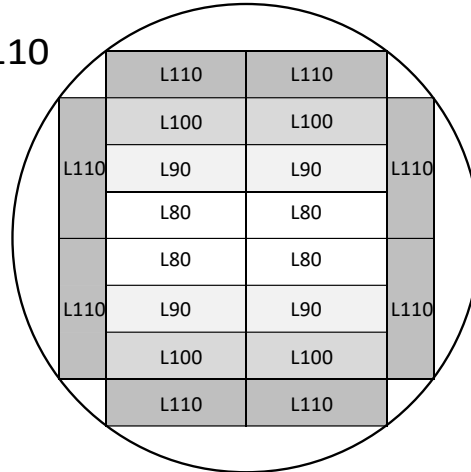


L60 4枚
L70 4枚
L80 4枚
L90 8枚

L70 1枚
L80 2枚
L100 6枚
L110 10枚

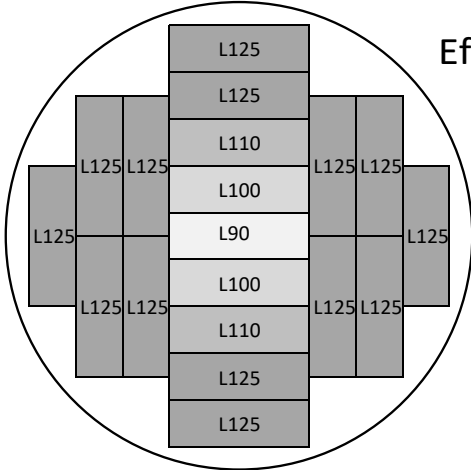


Ef110

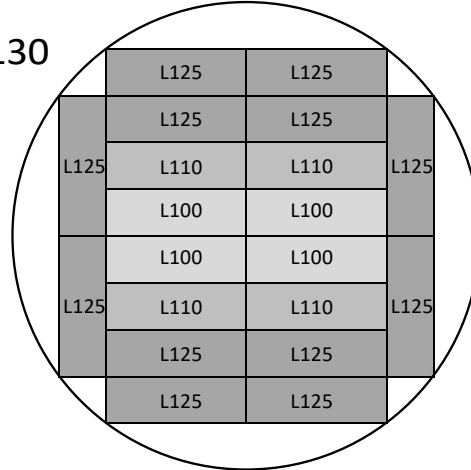


L80 4枚
L90 4枚
L100 4枚
L110 8枚

L90 1枚
L100 2枚
L110 2枚
L125 14枚

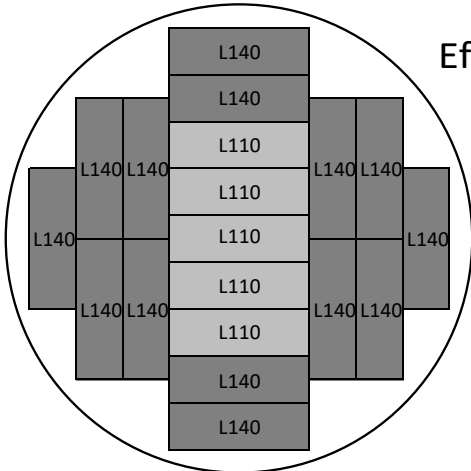


Ef130

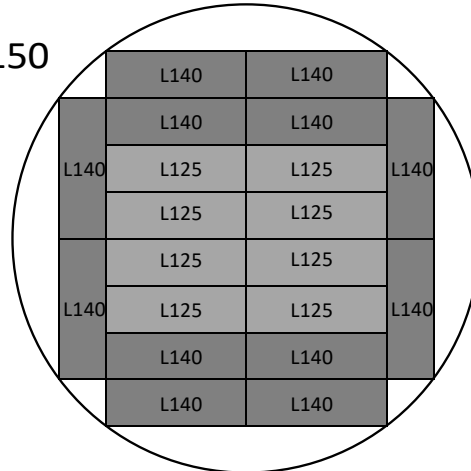


L100 4枚
L110 4枚
L125 12枚

L110 5枚
L140 14枚



Ef150



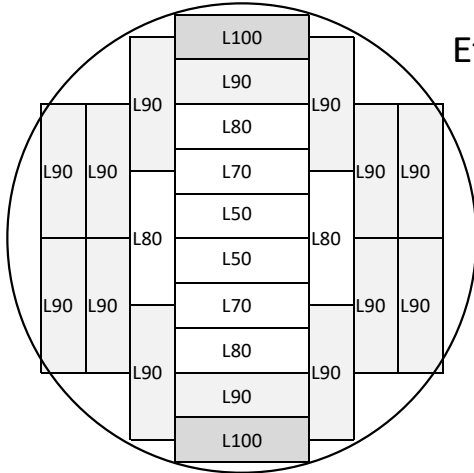
L125 8枚
L140 12枚

φ42cm

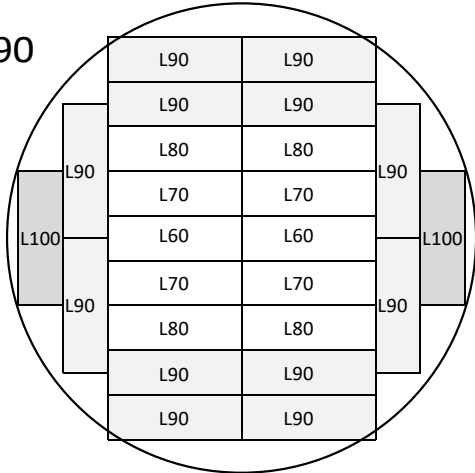
心持ち採材ラミナ全24枚

心去り採材ラミナ全24枚

- L60 4枚
- L70 4枚
- L80 4枚
- L90 8枚
- L100 2枚

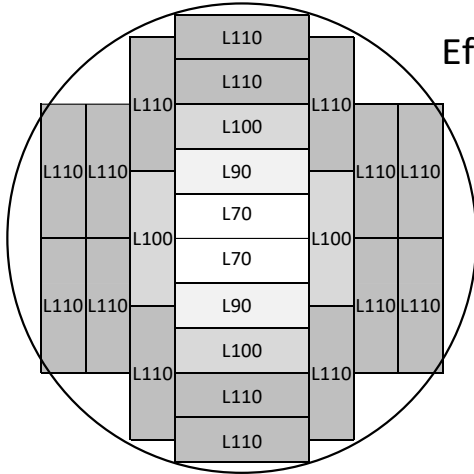


Ef90

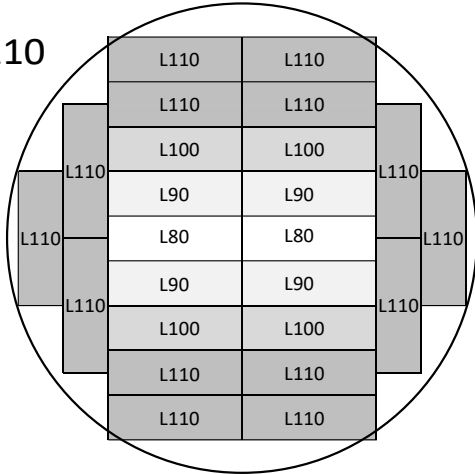


- L60 2枚
- L70 4枚
- L80 4枚
- L90 12枚
- L100 2枚

- L70 2枚
- L90 2枚
- L100 4枚
- L110 16枚

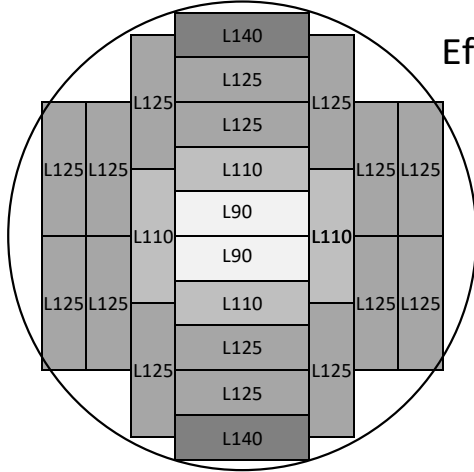


Ef110

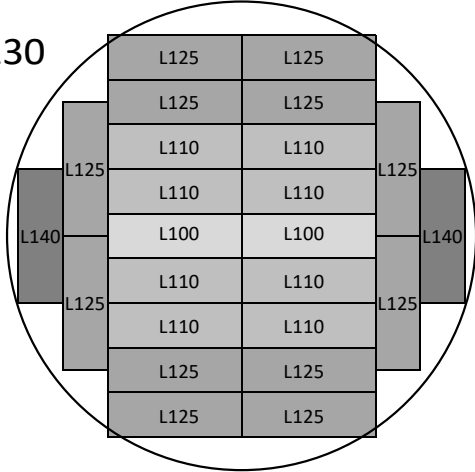


- L80 2枚
- L90 4枚
- L100 4枚
- L110 14枚

- L90 2枚
- L110 4枚
- L125 16枚
- L140 2枚

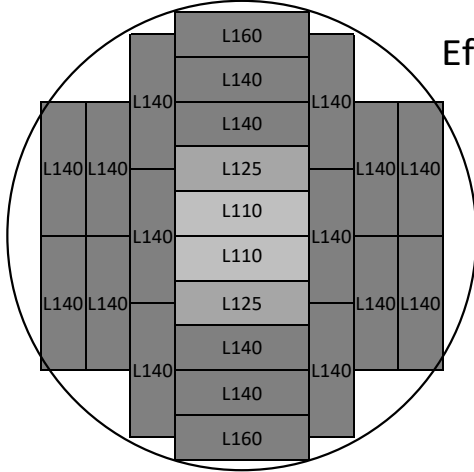


Ef130

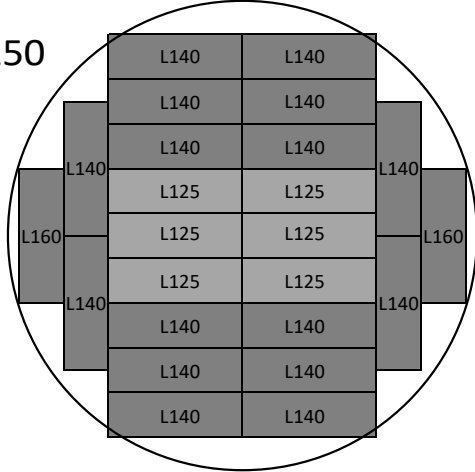


- L100 2枚
- L110 8枚
- L125 12枚
- L140 2枚

- L110 2枚
- L125 2枚
- L140 18枚
- L160 2枚



Ef150



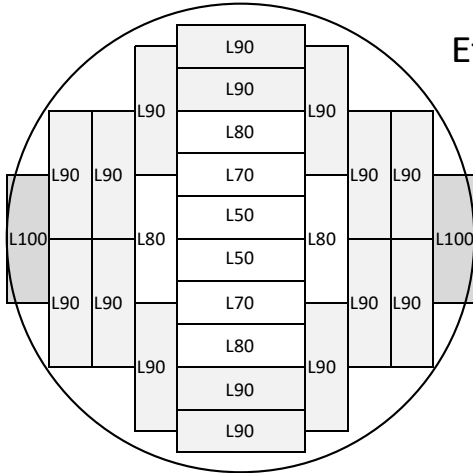
- L125 6枚
- L140 16枚
- L160 2枚

φ44cm

心持ち採材ラミナ全26枚

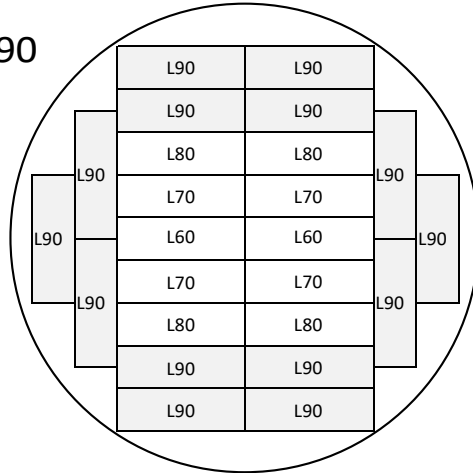
心去り採材ラミナ全24枚

- L50 2枚
- L70 2枚
- L80 4枚
- L90 16枚
- L100 2枚

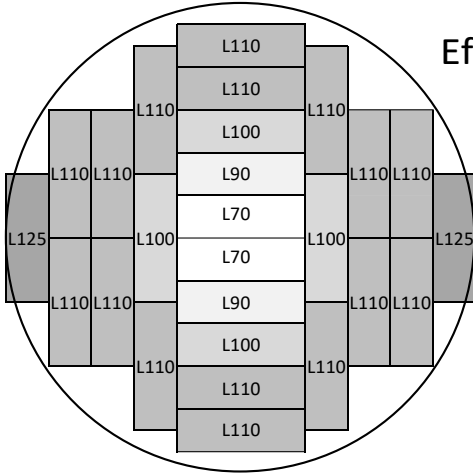


Ef90

- L60 2枚
- L70 4枚
- L80 4枚
- L90 14枚

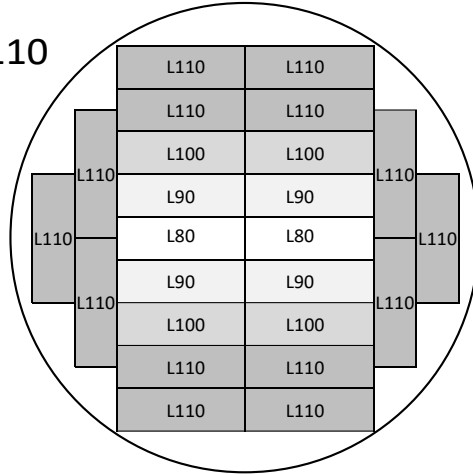


- L70 2枚
- L90 2枚
- L100 4枚
- L110 16枚
- L125 2枚

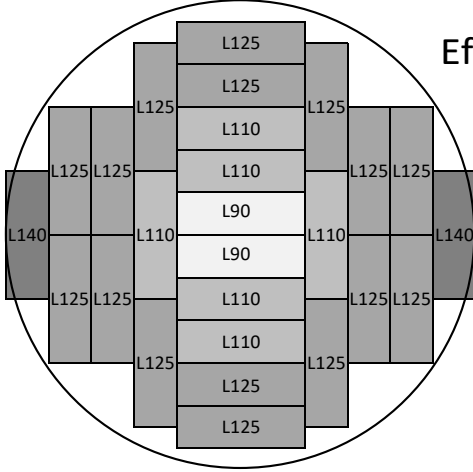


Ef110

- L80 2枚
- L90 4枚
- L100 4枚
- L110 14枚

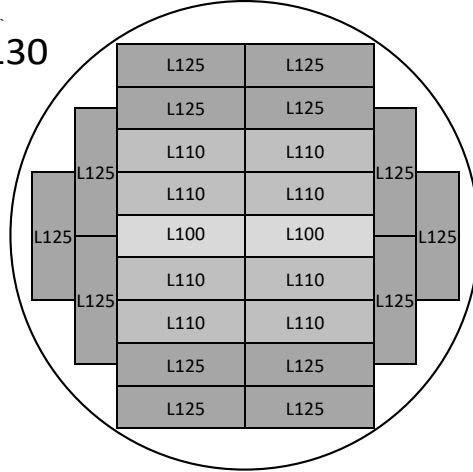


- L90 2枚
- L110 6枚
- L125 16枚
- L140 2枚

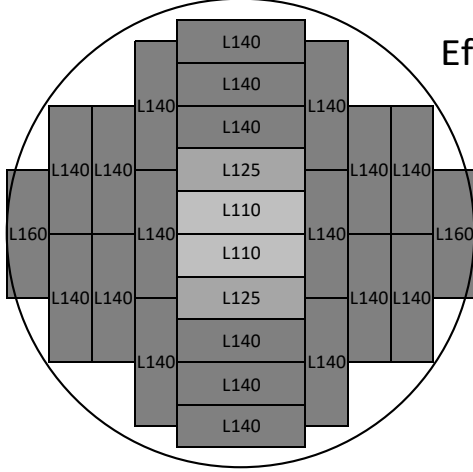


Ef130

- L100 2枚
- L110 8枚
- L125 14枚

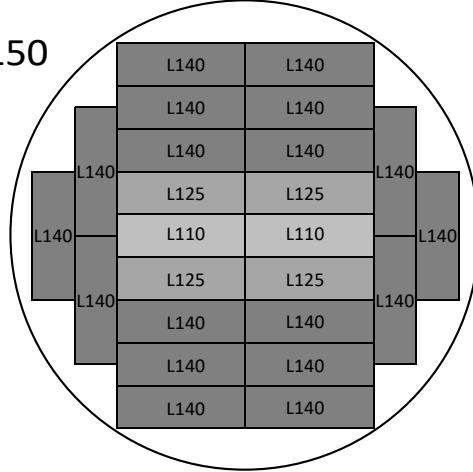


- L110 2枚
- L125 2枚
- L140 20枚
- L160 2枚



Ef150

- L110 2枚
- L125 4枚
- L140 18枚

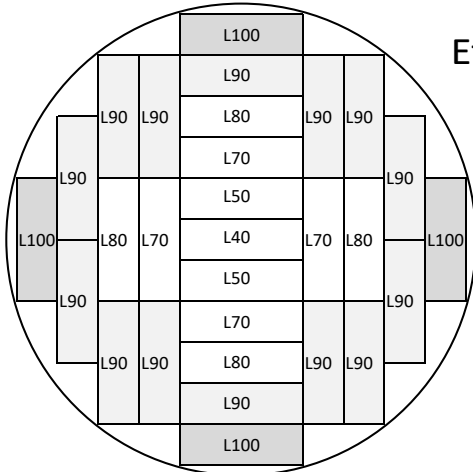


φ46cm

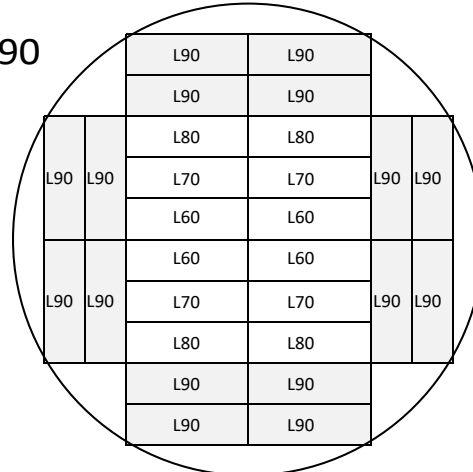
心持ち採材ラミナ全29枚

心去り採材ラミナ全28枚

- L40 1枚
- L50 2枚
- L70 4枚
- L80 4枚
- L90 14枚
- L100 4枚

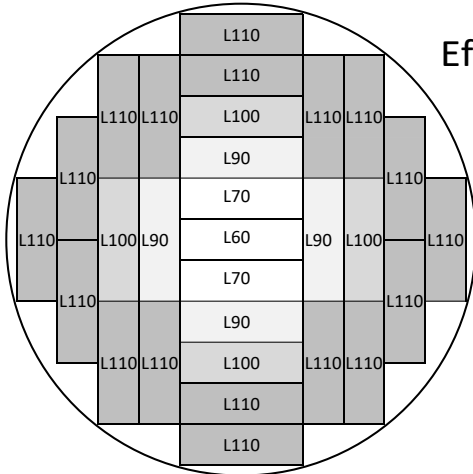


Ef90

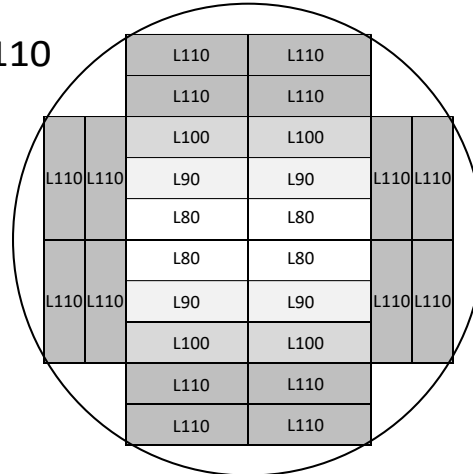


- L60 4枚
- L70 4枚
- L80 4枚
- L90 16枚

- L60 1枚
- L70 2枚
- L90 4枚
- L100 4枚
- L110 18枚

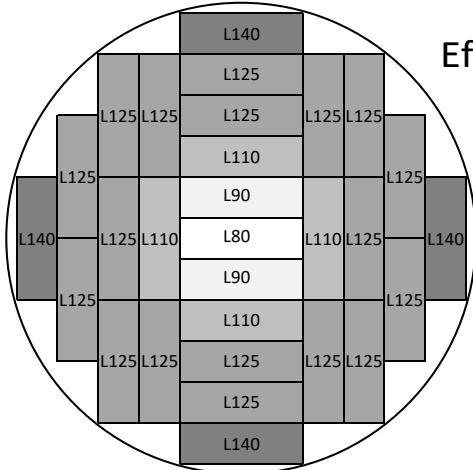


Ef110

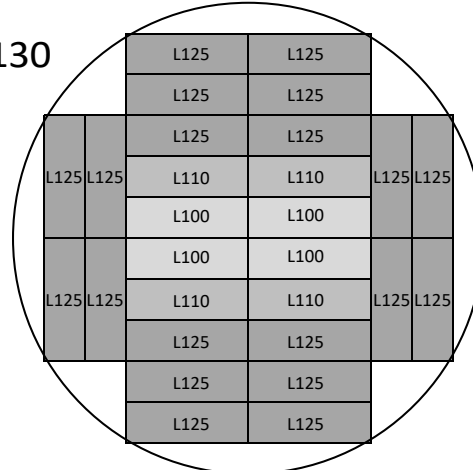


- L80 4枚
- L90 4枚
- L100 4枚
- L110 16枚

- L80 1枚
- L90 2枚
- L110 4枚
- L125 18枚
- L140 4枚

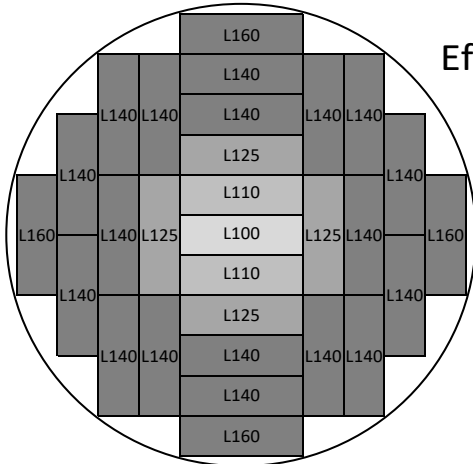


Ef130

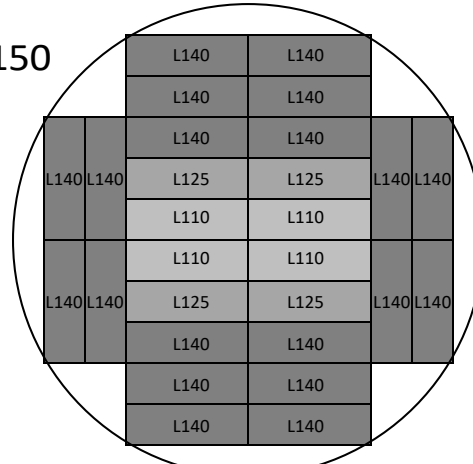


- L100 4枚
- L110 4枚
- L125 20枚

- L100 1枚
- L110 2枚
- L125 4枚
- L140 18枚
- L160 4枚



Ef150



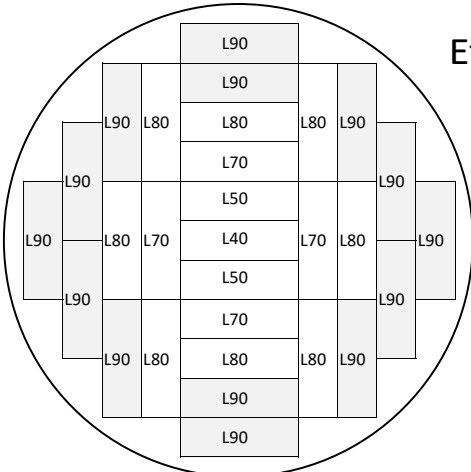
- L110 4枚
- L125 4枚
- L140 20枚

φ48cm

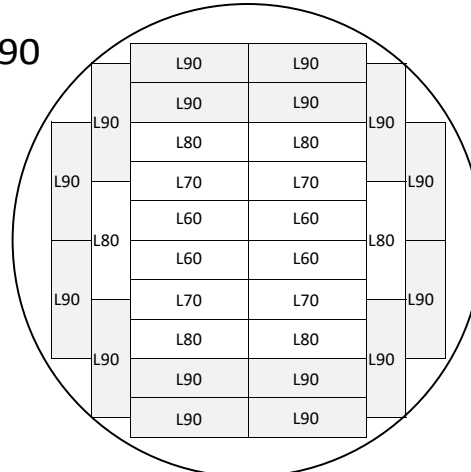
心持ち採材ラミナ全29枚

心去り採材ラミナ全30枚

- L40 1枚
- L50 2枚
- L70 4枚
- L80 8枚
- L90 14枚

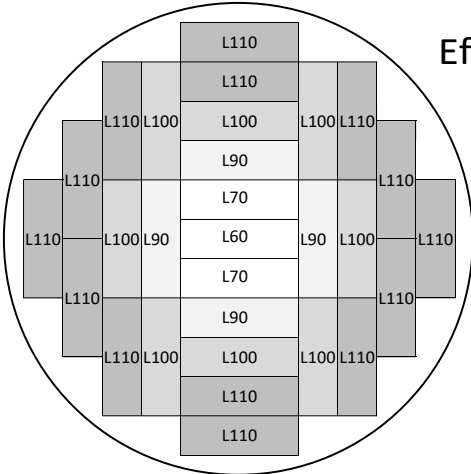


Ef90

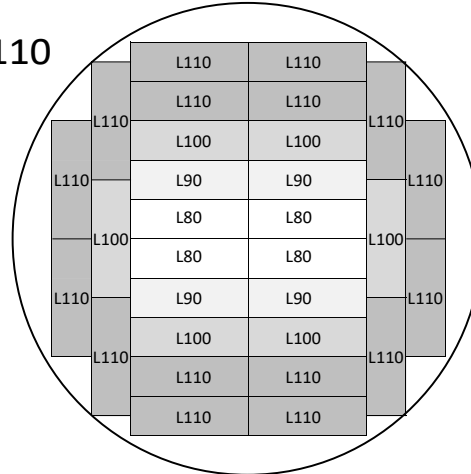


- L60 4枚
- L70 4枚
- L80 6枚
- L90 16枚

- L60 1枚
- L70 2枚
- L90 4枚
- L100 8枚
- L110 14枚

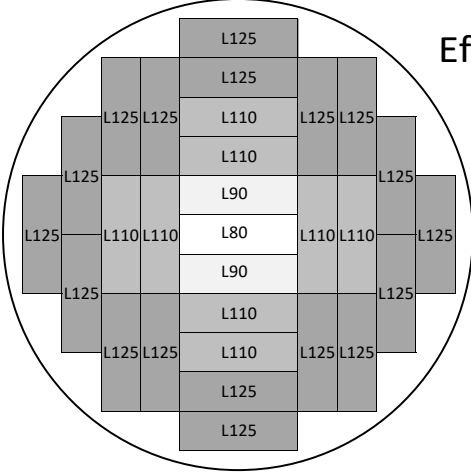


Ef110

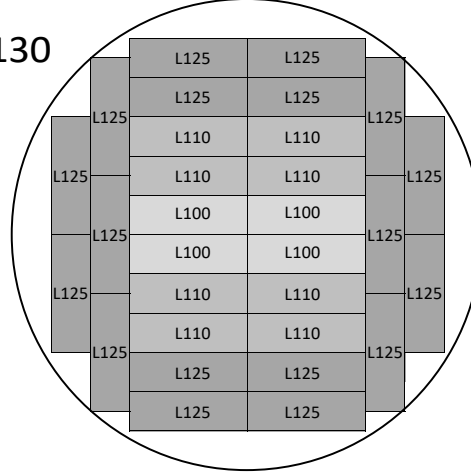


- L80 4枚
- L90 4枚
- L100 6枚
- L110 16枚

- L80 1枚
- L90 2枚
- L110 8枚
- L125 18枚

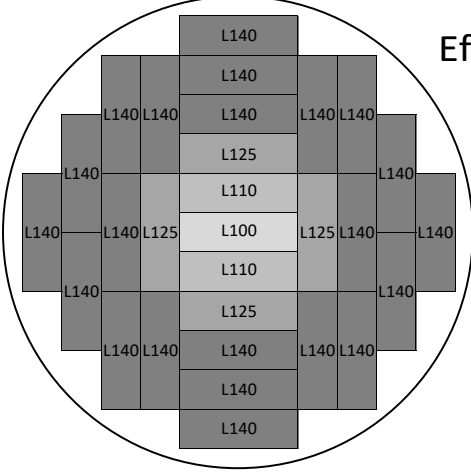


Ef130

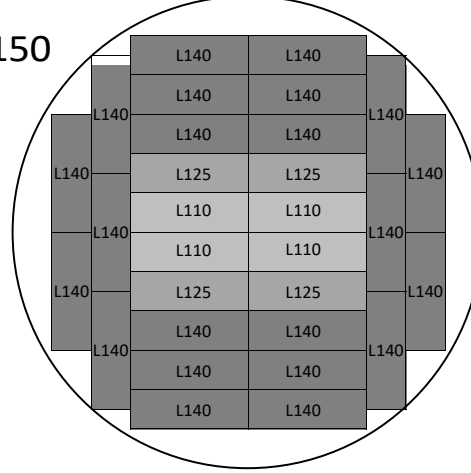


- L100 4枚
- L110 8枚
- L125 18枚

- L100 1枚
- L110 2枚
- L125 4枚
- L140 22枚



Ef150



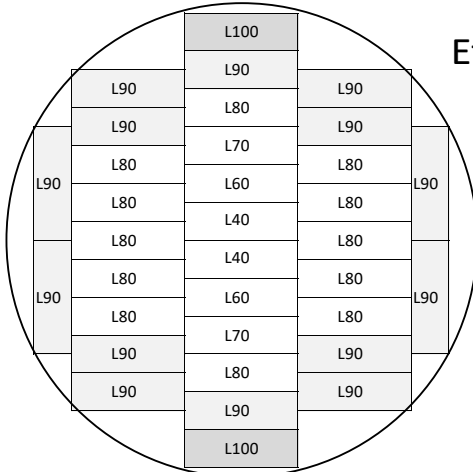
- L110 4枚
- L125 4枚
- L140 22枚

φ50cm

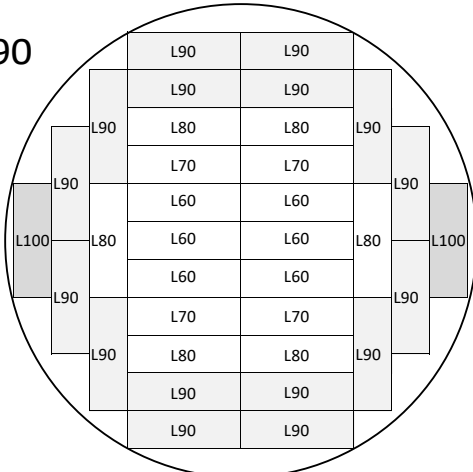
心持ち採材ラミナ全34枚

心去り採材ラミナ全34枚

L40 2枚
L60 2枚
L70 2枚
L80 12枚
L90 14枚
L100 2枚

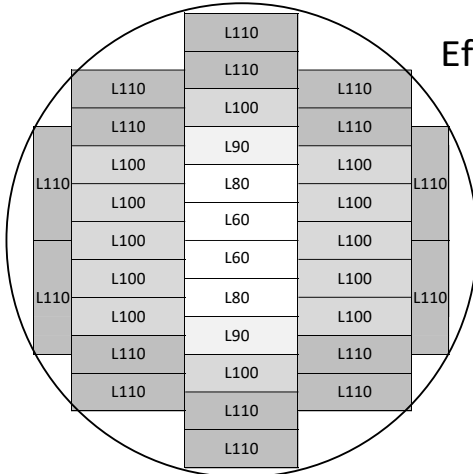


Ef90

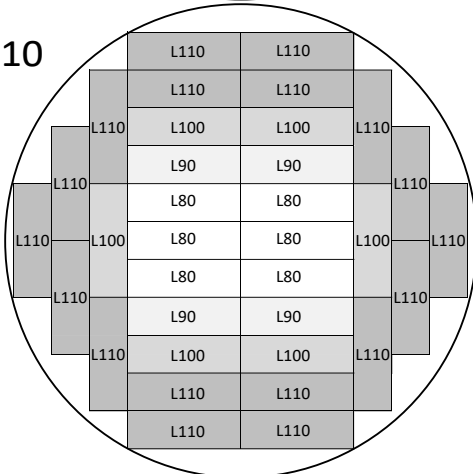


L60 6枚
L70 4枚
L80 6枚
L90 16枚
L100 2枚

L60 2枚
L80 2枚
L90 2枚
L100 12枚
L110 16枚

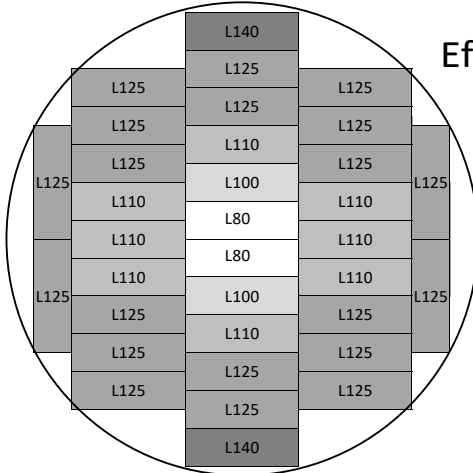


Ef110

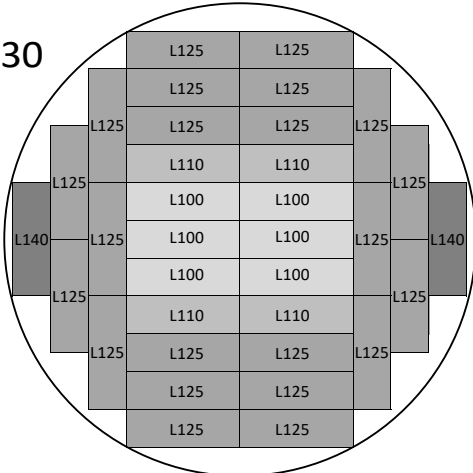


L80 6枚
L90 4枚
L100 6枚
L110 18枚

L80 2枚
L100 2枚
L110 8枚
L125 20枚
L140 2枚

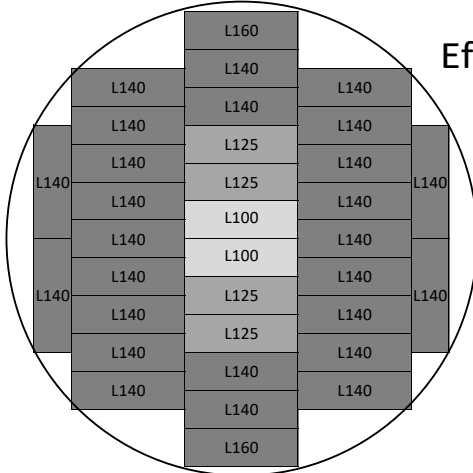


Ef130

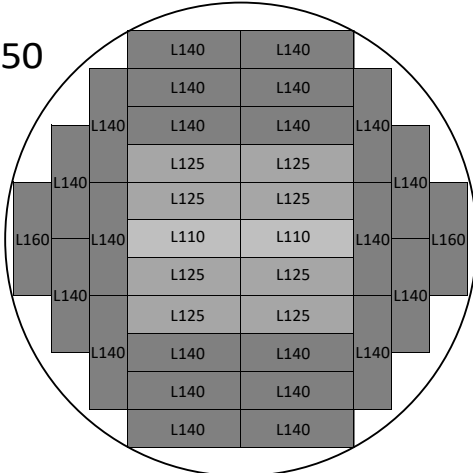


L100 6枚
L110 4枚
L125 22枚
L140 2枚

L100 2枚
L125 4枚
L140 26枚
L160 2枚



Ef150



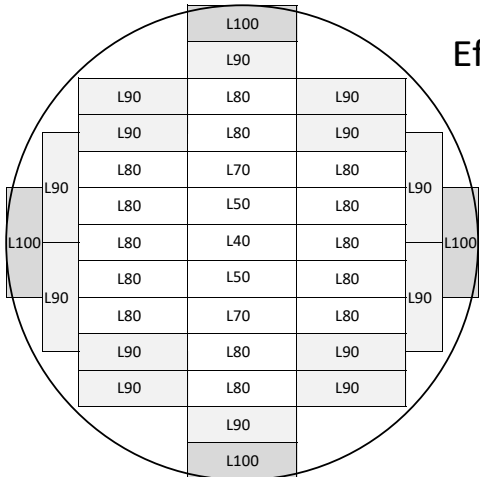
L110 2枚
L125 8枚
L140 22枚
L160 2枚

φ52cm

心持ち採材ラミナ全37枚

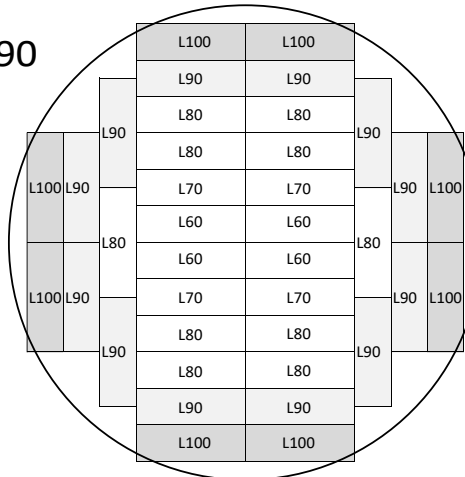
心去り採材ラミナ全38枚

- L40 1枚
- L50 2枚
- L70 2枚
- L80 14枚
- L90 14枚
- L100 4枚

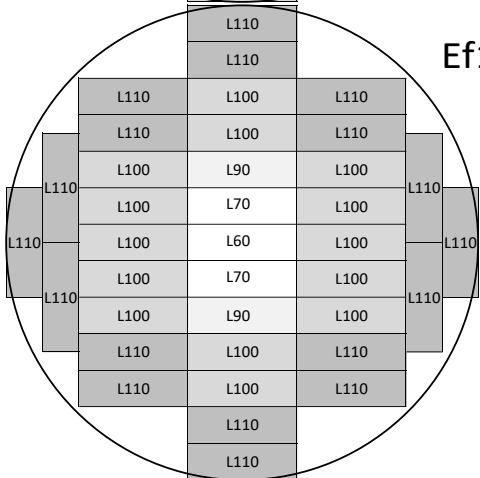


Ef90

- L60 4枚
- L70 4枚
- L80 10枚
- L90 12枚
- L100 8枚

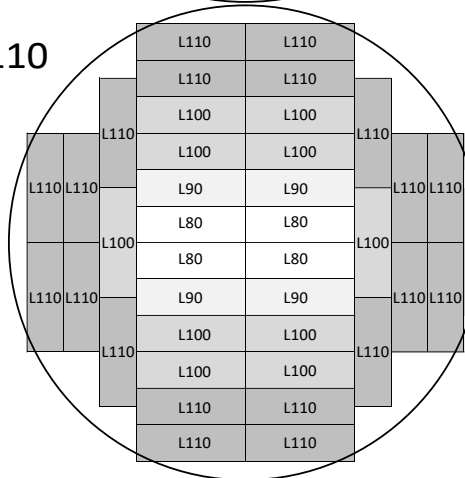


- L60 1枚
- L70 2枚
- L90 2枚
- L100 14枚
- L110 18枚

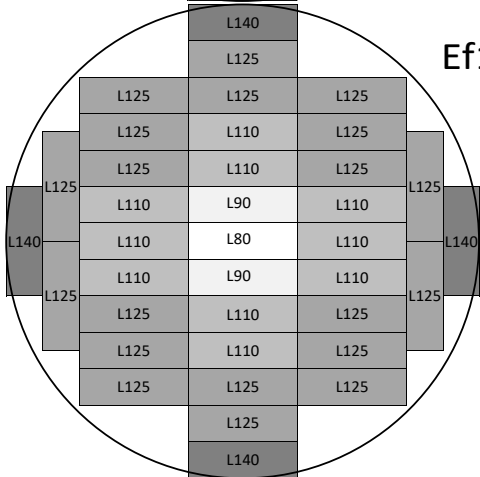


Ef110

- L80 4枚
- L90 4枚
- L100 10枚
- L110 20枚

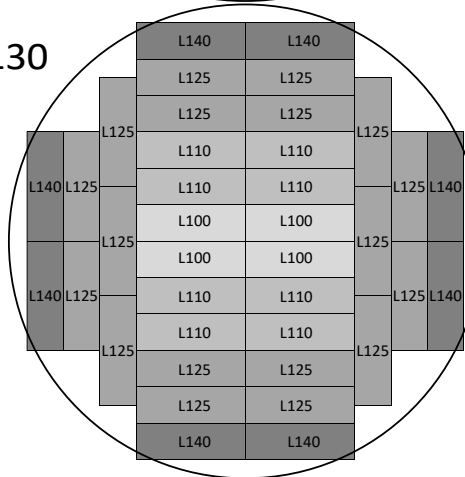


- L80 1枚
- L90 2枚
- L110 10枚
- L125 20枚
- L140 4枚

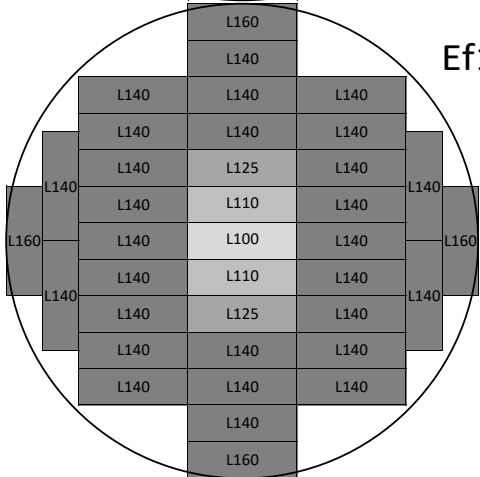


Ef130

- L100 4枚
- L110 8枚
- L125 18枚
- L140 8枚

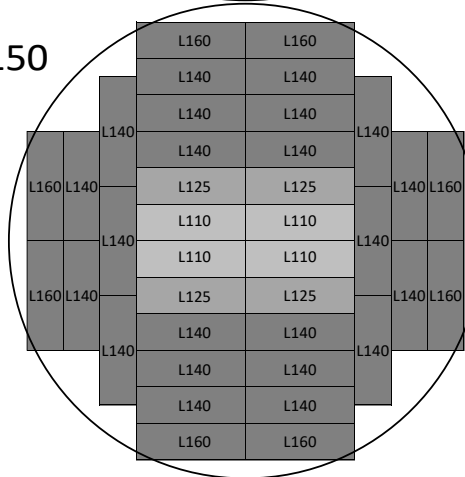


- L100 1枚
- L110 2枚
- L125 2枚
- L140 28枚
- L160 4枚



Ef150

- L110 4枚
- L125 4枚
- L140 22枚
- L160 8枚

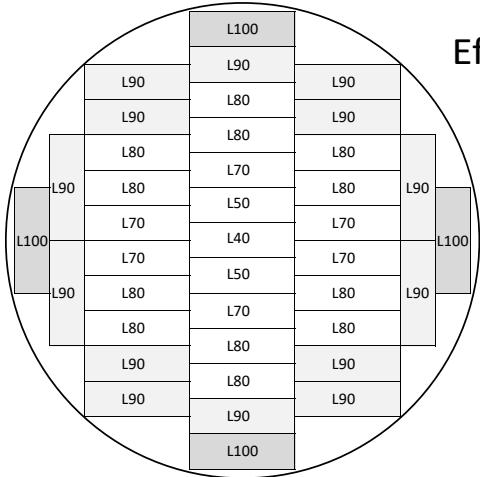


φ54cm

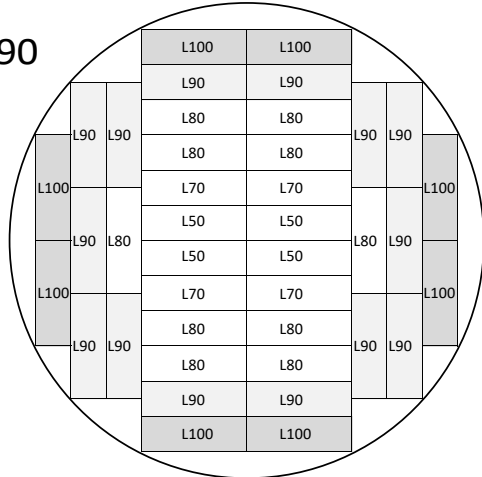
心持ち採材ラミナ全39枚

心去り採材ラミナ全40枚

- L40 1枚
- L50 2枚
- L70 6枚
- L80 12枚
- L90 14枚
- L100 4枚

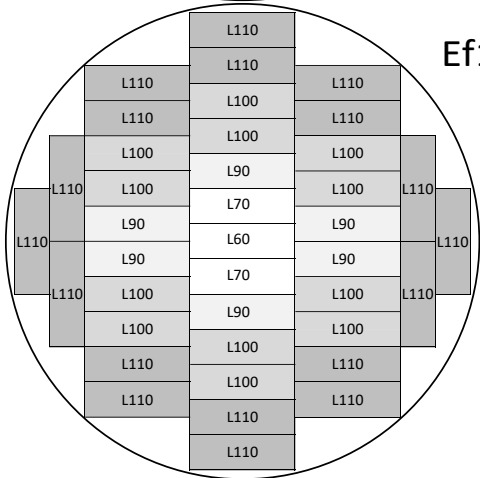


Ef90

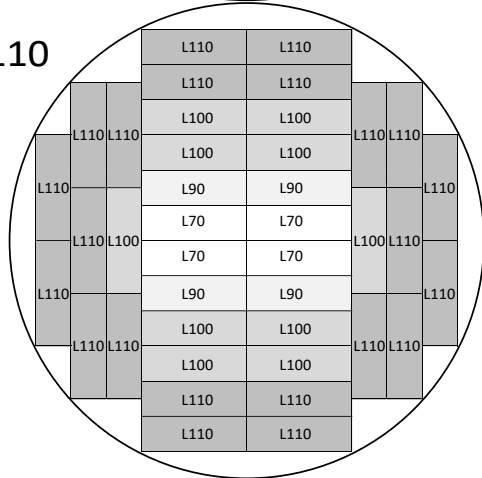


- L50 4枚
- L70 4枚
- L80 10枚
- L90 14枚
- L100 8枚

- L60 1枚
- L70 2枚
- L90 6枚
- L100 12枚
- L110 18枚

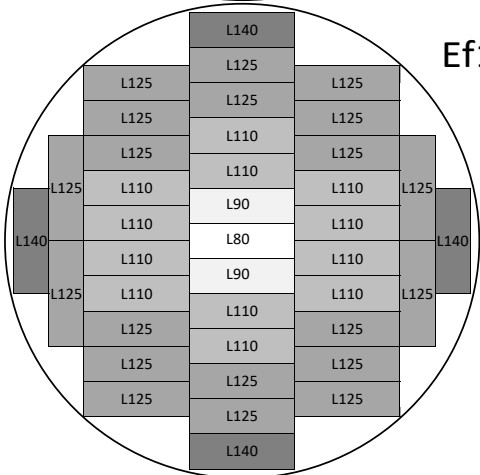


Ef110

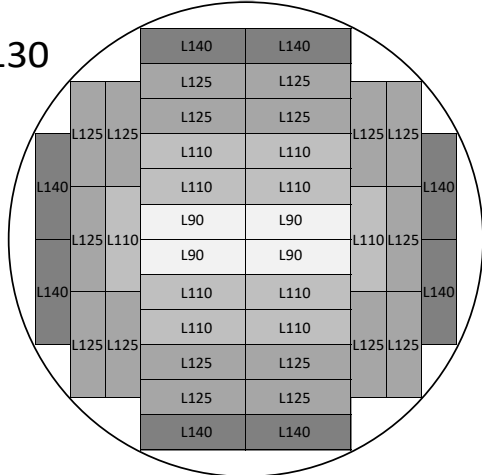


- L70 4枚
- L90 4枚
- L100 10枚
- L110 22枚

- L80 1枚
- L90 2枚
- L110 12枚
- L125 20枚
- L140 4枚

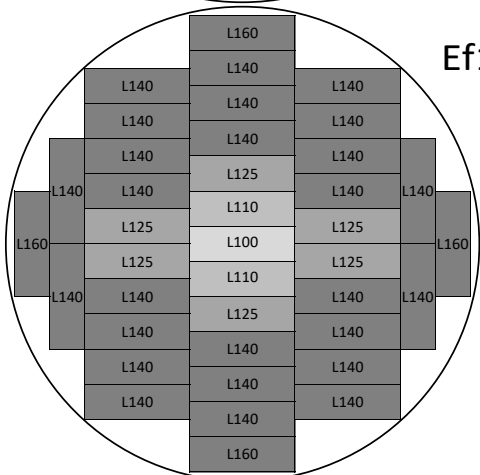


Ef130

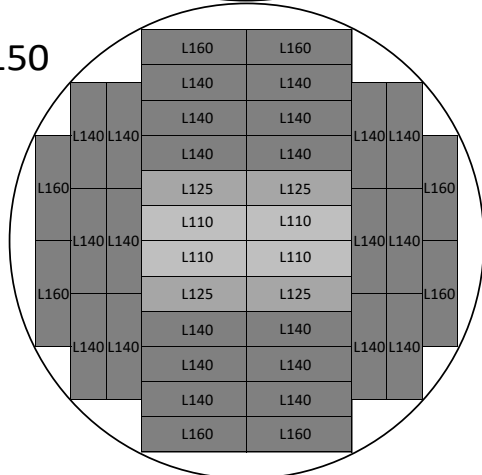


- L90 4枚
- L110 10枚
- L125 18枚
- L140 8枚

- L100 1枚
- L110 2枚
- L125 6枚
- L140 26枚
- L160 4枚



Ef150



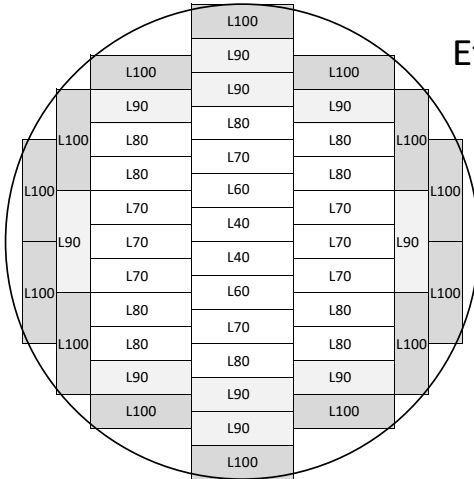
- L110 4枚
- L125 4枚
- L140 24枚
- L160 8枚

φ56cm

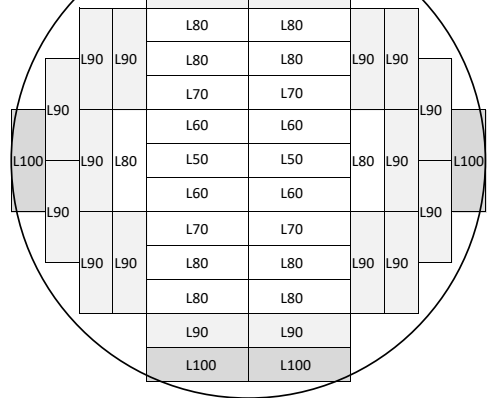
心持ち採材ラミナ全46枚

心去り採材ラミナ全44枚

- L40 2枚
- L60 2枚
- L70 8枚
- L80 10枚
- L90 10枚
- L100 14枚

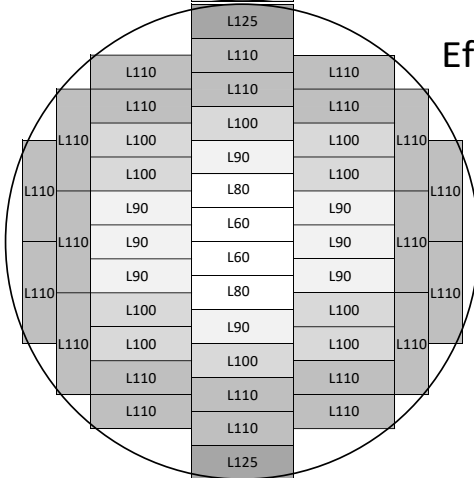


Ef90

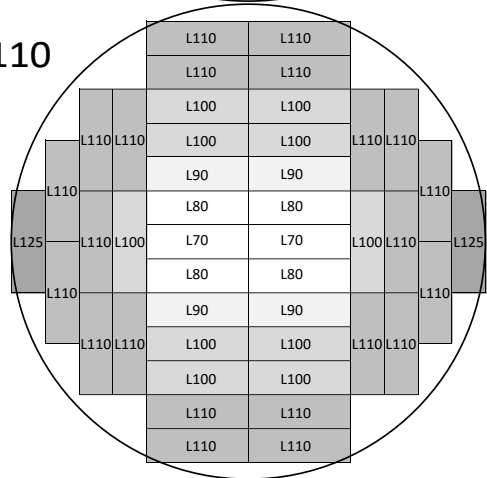


- L50 2枚
- L60 4枚
- L70 4枚
- L80 10枚
- L90 18枚
- L100 6枚

- L60 2枚
- L80 2枚
- L90 8枚
- L100 10枚
- L110 22枚
- L125 2枚

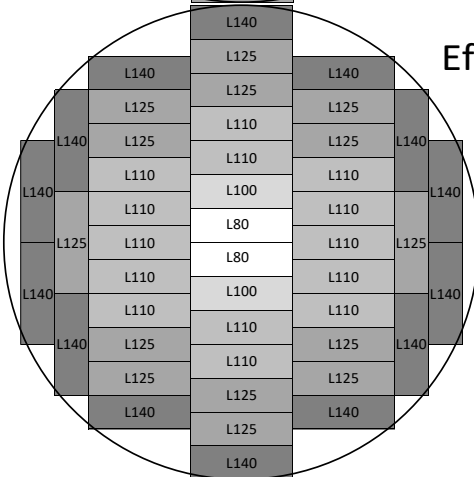


Ef110

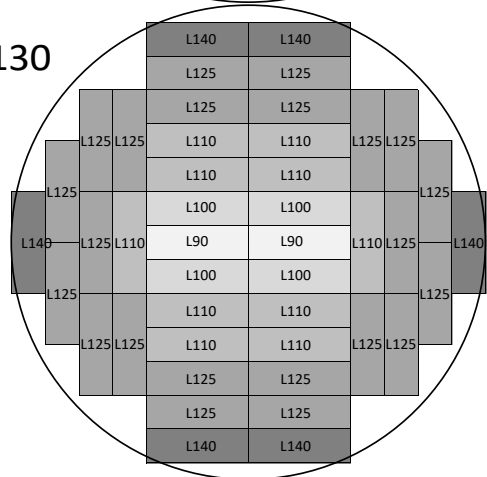


- L70 2枚
- L80 4枚
- L90 4枚
- L100 10枚
- L110 22枚
- L125 2枚

- L80 2枚
- L100 2枚
- L110 14枚
- L125 14枚
- L140 14枚

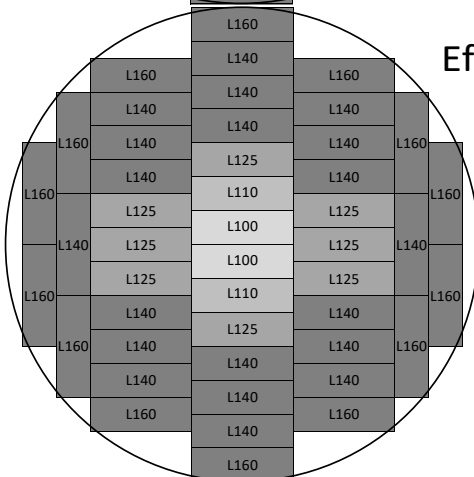


Ef130

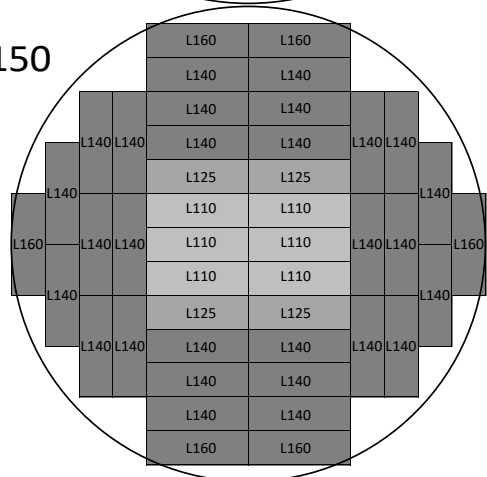


- L90 2枚
- L100 4枚
- L110 10枚
- L125 22枚
- L140 6枚

- L100 2枚
- L110 2枚
- L125 6枚
- L140 28枚
- L160 6枚



Ef150



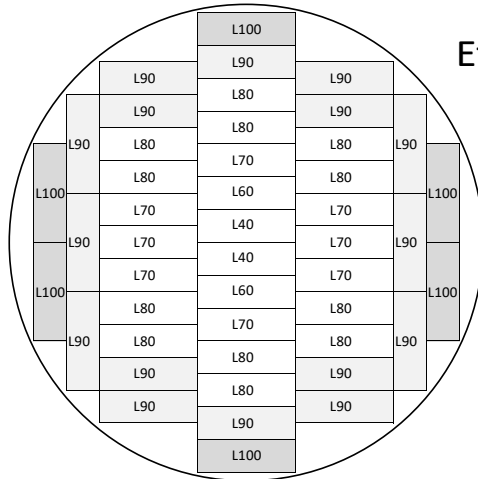
- L110 6枚
- L125 4枚
- L140 28枚
- L160 6枚

φ58cm

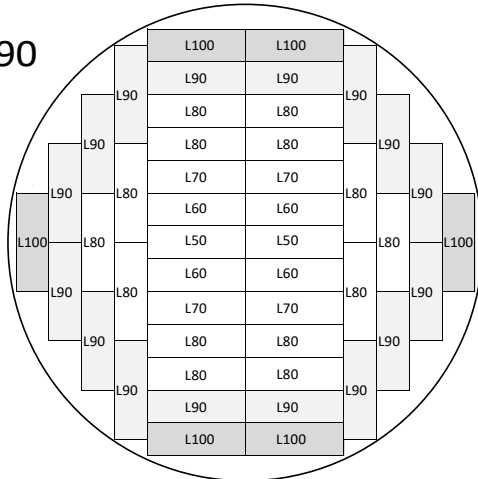
心持ち採材ラミナ全46枚

心去り採材ラミナ全46枚

- L40 2枚
- L60 2枚
- L70 8枚
- L80 12枚
- L90 16枚
- L100 6枚

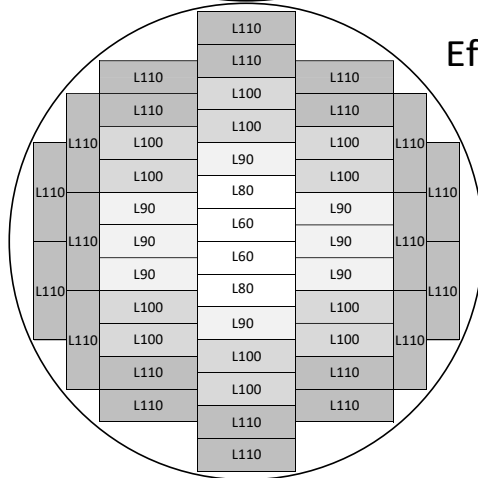


Ef90

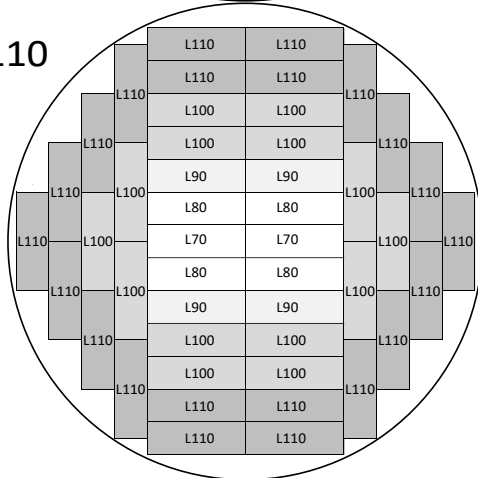


- L50 2枚
- L60 4枚
- L70 4枚
- L80 14枚
- L90 16枚
- L100 6枚

- L60 2枚
- L80 2枚
- L90 8枚
- L100 12枚
- L110 22枚

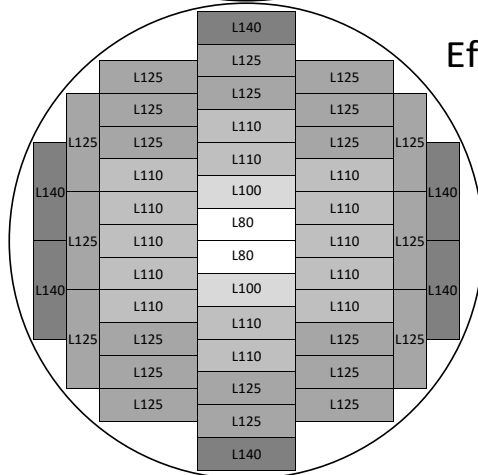


Ef110

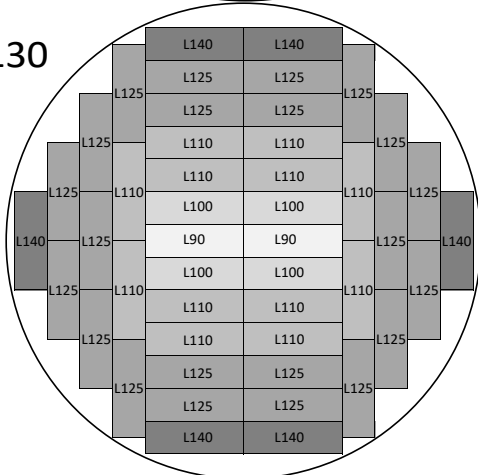


- L70 2枚
- L80 4枚
- L90 4枚
- L100 14枚
- L110 22枚

- L80 2枚
- L100 2枚
- L110 14枚
- L125 22枚
- L140 6枚

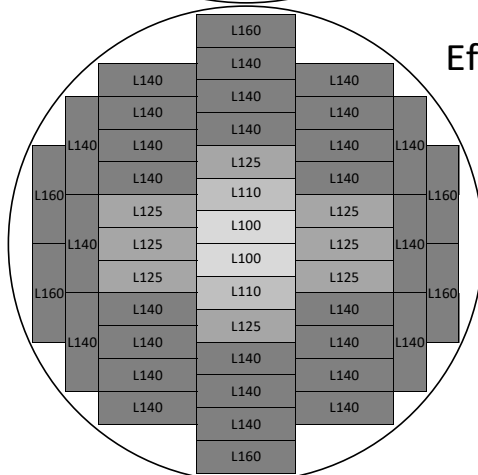


Ef130

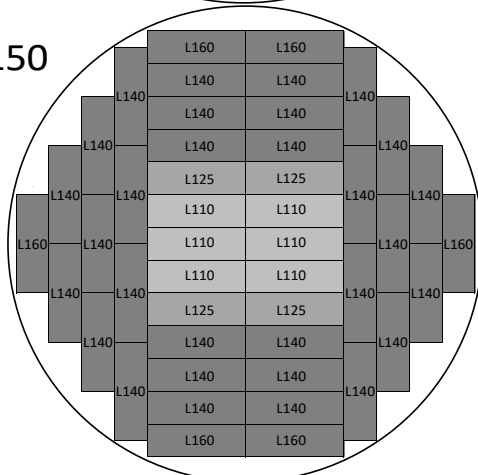


- L90 2枚
- L100 4枚
- L110 12枚
- L125 22枚
- L140 6枚

- L100 2枚
- L110 2枚
- L125 8枚
- L140 28枚
- L160 6枚



Ef150



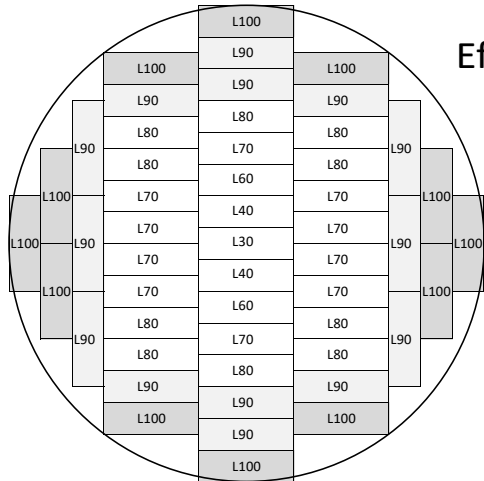
- L110 6枚
- L125 4枚
- L140 30枚
- L160 6枚

φ60cm

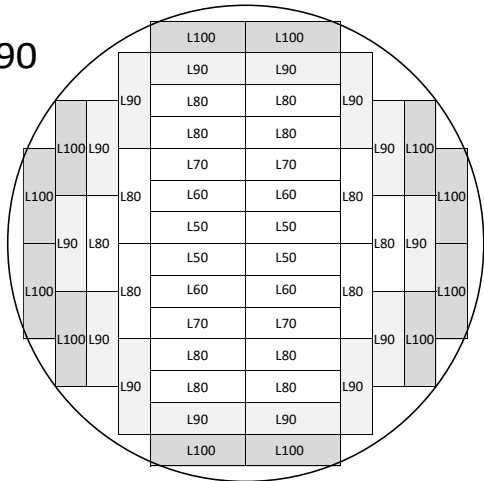
心持ち採材ラミナ全51枚

心去り採材ラミナ全52枚

- L30 1枚
- L40 2枚
- L60 2枚
- L70 10枚
- L80 10枚
- L90 14枚
- L100 12枚

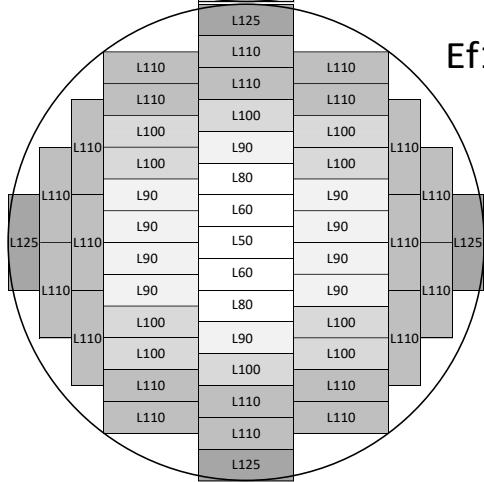


Ef90

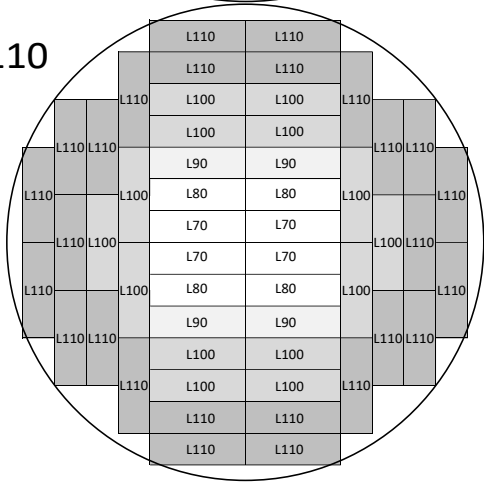


- L50 4枚
- L60 4枚
- L70 4枚
- L80 14枚
- L90 14枚
- L100 12枚

- L50 1枚
- L60 2枚
- L80 2枚
- L90 10枚
- L100 10枚
- L110 22枚
- L125 4枚

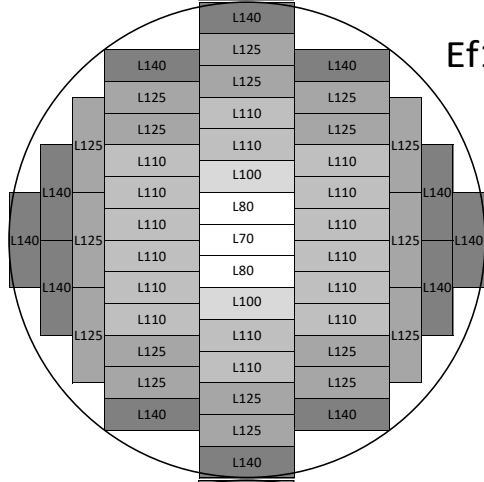


Ef110

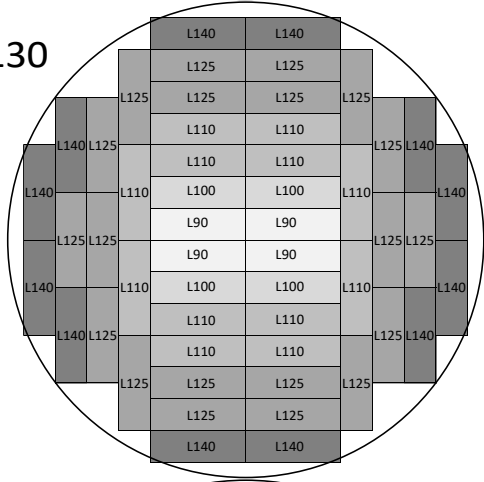


- L70 4枚
- L80 4枚
- L90 4枚
- L100 14枚
- L110 26枚

- L70 1枚
- L80 2枚
- L100 2枚
- L110 16枚
- L125 18枚
- L140 12枚

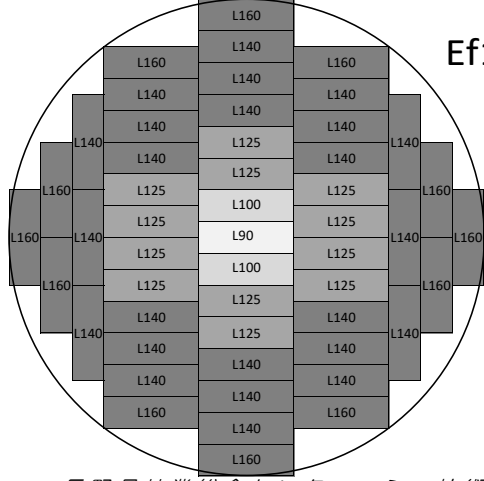


Ef130

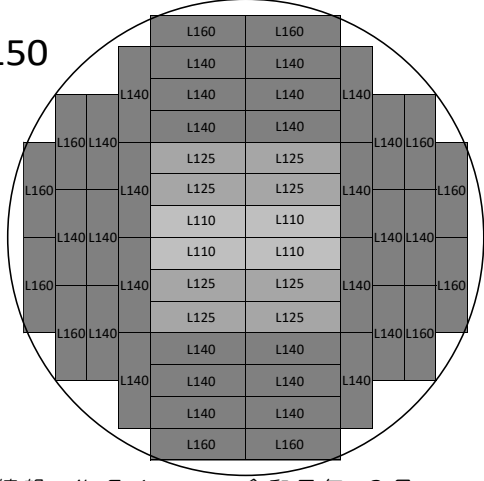


- L90 4枚
- L100 4枚
- L110 12枚
- L125 20枚
- L140 12枚

- L90 1枚
- L100 2枚
- L125 12枚
- L140 24枚
- L160 12枚



Ef150



- L110 4枚
- L125 8枚
- L140 28枚
- L160 12枚