

$$\mathbb{1} \rtimes \mathbb{1} \rtimes \mathbb{1} \xleftarrow{\quad} \mathbb{1}$$

C*-bimod

$$\mathbb{1} \xleftarrow{\mathbb{L}} \mathbb{1}^m \text{ m-lin}$$

$$\mathbb{1} \begin{array}{c} \diagdown \\ \mathbb{1} \\ \mathbb{1} \end{array} \begin{array}{c} \mathbb{1} \\ \mathbb{1} \\ \mathbb{1} \end{array} = \frac{\mathbb{L} \text{ stet}}{\mathbb{L} \text{ stet}}$$

$$\mathbb{1} \rtimes \mathbb{1} \rtimes \mathbb{1} \xleftarrow{\quad} \mathbb{1}$$

W*-bimod

$$\mathbb{1} \xleftarrow{\mathbb{L}} \mathbb{1}^m \text{ m-lin}$$

$$\mathbb{1} \begin{array}{c} \diagdown \\ \mathbb{1} \\ \mathbb{1} \end{array} \begin{array}{c} \mathbb{1} \\ \mathbb{1} \\ \mathbb{1} \end{array} = \frac{\mathbb{L} \text{ w-stet}}{\mathbb{L} \text{ w-stet}}$$

$$\mathbb{1} \begin{array}{c} \diagdown \\ \mathbb{1} \\ \mathbb{1} \end{array} \begin{array}{c} \mathbb{1} \\ \mathbb{1} \\ \mathbb{1} \end{array} = \sum_m \mathbb{1} \begin{array}{c} \diagdown \\ \mathbb{1} \\ \mathbb{1} \end{array} \begin{array}{c} \mathbb{1} \\ \mathbb{1} \\ \mathbb{1} \end{array}$$

$$\mathbb{1} \begin{array}{c} \diagdown \\ \mathbb{1} \\ \mathbb{1} \end{array} \begin{array}{c} \mathbb{1} \\ \mathbb{1} \\ \mathbb{1} \end{array} \xleftarrow{d} \mathbb{1} \begin{array}{c} \diagdown \\ \mathbb{1} \\ \mathbb{1} \end{array} \begin{array}{c} \mathbb{1} \\ \mathbb{1} \\ \mathbb{1} \end{array}$$

$$\mathbb{L}d \overbrace{\mathbb{1}^0 \dots \mathbb{1}^m} = \mathbb{1}^0 \rtimes \overbrace{\mathbb{L} \mathbb{1}^1 \dots \mathbb{1}^m} + (-1)^{m+1} \overbrace{\mathbb{L} \mathbb{1}^0 \dots \mathbb{1}^{m-1}} \rtimes \mathbb{1}^m + \sum_{1 \leq i \leq m} (-1)^i \overbrace{\mathbb{L} \mathbb{1}^0 \dots \mathbb{1}^{i-2} \mathbb{1}^{i-1} \times \mathbb{1}^i \mathbb{1}^{i+1} \dots \mathbb{1}^m}$$

$$\mathbb{L} \mathbb{L} d = \mathbb{L} d \mathbb{1}$$

$$\mathbb{L} d d = 0$$