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K-theory of pseudodifferential operators with semiperiodic symbols on a cylinder.

Let $B$ be a compact Riemannian manifold, let $\Omega$ denote the cylinder $\mathbb{R} \times B$, $\Delta_{\Omega}$ its Laplace operator and $\Lambda = (1 - \Delta_{\Omega})^{-1/2}$. Let $\mathcal{A}$ denote the $C^*$-algebra of bounded operators on $L^2(\mathbb{R} \times B)$ generated by all the classical pseudodifferential operators on $\mathbb{R} \times B$ of the form $L \Lambda^N$, $N$ a nonnegative integer and $L$ an $N$-th order differential operator whose (local) coefficients approach $2\pi$-periodic functions at $+\infty$ and $-\infty$. Let $\mathcal{E}$ denote the kernel of the continuous extension of the principal symbol to $\mathcal{A}$. The problem of computing the K-theory index map $\delta_1(K_1(\mathcal{A}/\mathcal{E})) \to K_0(\mathcal{E}) \cong \mathbb{Z}^2$ on an element of $K_1(\mathcal{A}/\mathcal{E})$ is reduced to the problem of computing the Fredholm indices of two elliptic operators on the compact manifold $S^1 \times B$. In the case $B = S^1$, it follows from considerations about various exact sequences of $C^*$-subalgebras of $\mathcal{A}$ that $\delta_1$ is onto and that $K_0(\mathcal{A}) \cong \mathbb{Z}^5$ and $K_1(\mathcal{A}) \cong \mathbb{Z}^4$. This talk is based on joint work with Patricia Hess.