

# APEX Millimeter Observations of Methanol Emission Toward High-mass Star-forming Cores

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© 2019. The American Astronomical Society. All rights reserved..We present 247 GHz molecular line observations of methanol (CH<sub>3</sub>OH) toward 16 massive star-forming regions using the APEX telescope with an angular resolution of 25". The sample covers a range of evolutionary states, including warm molecular cores (WMCs), hot molecular cores, and ultracompact H ii regions. The hot cores, all of which include UC H ii regions, show rich molecular line spectra, although the strength of different species and transitions varies from source to source. In contrast, the warm cores do not show significant molecular line emission. Multiple methanol transitions are detected toward nine of the hot cores; eight of these had enough transitions to use the rotation diagram method to estimate rotational temperatures and column densities. The temperatures lie in the range of 104-190 K and column densities from  $3 \times 10^{16}$  to  $7 \times 10^{18}$  cm<sup>-2</sup>. Using the average methanol line parameters, we estimate virial masses, whi