Photoluminescence and photocurrent measurement in monolayer MoTe$_2$ YA-QING BIE, GABRIELE GROSSO, DMITRI EFETOV, EFREN NAVARRO-MORATALLA, DIRK ENGLUND, PABLO JARILLO-HERRERO, Massachusetts Inst of Tech-MIT — 2D transition metal dichalcogenides (2D-TMD), such as MoS$_2$, WS$_2$, WSe$_2$, MoSe$_2$, have been verified with many remarkable physical properties including the indirect to direct band transition and valley dependent spin polarization. As one of the 2D-TMD family member, monolayer 2H-MoTe$_2$ is proved to be a direct bandgap semiconductor with strong spin orbital interaction and a significantly low bandgap $\sim$ 1.10eV. However, the effect of the enhanced coulomb interaction arising from reduced dielectric screening in monolayer MoTe$_2$ has yet to be experimentally demonstrated. Here we employ the near infrared (NIR) photoluminescence and photocurrent measurement to study the quasi-particle interactions at different carrier concentration. This study sheds light on manipulating excitons in MoTe$_2$ and designing highly efficient NIR optoelectronic devices.

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Date submitted: 13 Nov 2014

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