

Quantum Fluctuations in Thermodynamic Systems

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Abstract²7KH 0LGGOH (DVW *XOI UHJLRQ KDV
ZLWQHVVHG UDSLQ

JURZWKDQGGHYHORSPhQWLQPDQ\DUHDVRYHUWKHO
DVVWZRGHFDGHV
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LQIUDVWUXFWXUHSURMHFWV\DUHDPDMRUVKDUHRI
WKHGHYHORSPhQWVKDWKDV SDUWLFLSDWHG LQ
WKH FLYLOL]DWLRQ RI WKH FRXQWULHV RI WKH *XOI
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GLIIHUHQW\SHVRIH[SHUWVZKRFDPHIURPDOORYHUW
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DFFXPXODWLQJ IDFWRUV 0DQ\ DFFXPXODWHG
IDFWRUV DUH FRQVLGHUHG DV WKH SULQFLSOH
UHDVRO IRU WKH SUREOHP H[SHULHQFHG DW WKH
SURMHFW FRQVWUXFWLRQ VWDJH ZKLFK UHIOHFWHG
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FRPSOHWLRQ GHOD\ LQ FDVH SURMHFW PDQDJHUV
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HFV

Keywords²&RQVWUXFWLRQ PDQDJHPHQW FRQWURO
SURFHVV FRVW

FRQWUROSDQQLQJDQGVFKHGXLQJUROHVDQGUHVS
RQVLELOLWLHV

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WKH
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V\VOLNHUHV\VLGHQWLDO
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RI GHOD\ GXULQJ
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7KH DLPV DQG JRDOV RI WKH UHVHDUFK DUH WR
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HIIHW RI FXOWXUDO IDFWRUV LQ FRQVWUXFWLRQ
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SRUWDQFRIFXOWXUH DQG QDWLRQDO
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FULWLFDO HVSHFLDOO\ IRU FRQVWUXFWLRQ
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FRQWUDFWLQJ LQWHUQDWLRQDOLJWLRQ RI
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GHSHQGLQJ XSRQ WKH VLJH DQG W\SH RI WKH SURMHFW DQG UHTXLUHV FHUWDLQ W\SHV RI VNLOOV VXFK DV VWURQJ FRPPXQLFDWLRQ WHFKQLFDO H[SHULHQFH VHOI FRQILGHQFH DQG NQRZOHGJHRIWKHEXLOGLOLQJ SURFHVV &RQVWUXFWLRQ SURMHFW PDQDJHUV VKRXOG KDYH WKH HQRXJK H[SHULHQFH RI SODQQLQJ WKDW VKRXOG FRPSO\ ZLWK SURMHFW FULWHULD EDVHG RQ WKH WHFKQLFDO VWDQGDUGV DQG VSHFLILFDWLRQV LGHQWLILHGE\WKHFOLHQWDQG WKHFRQVXOWDQW W)DLOLQJWRGRVRZLOO UHVXOWLQPDMRUGHOD\VWRSURMHFWGHOLYHU\ 2QH DVSHFW RI WKH UROH DQG UHVSQVLELOLWLHV RI WKH FRQVWUXFWLRQSURMHFWPDQDJHULVWRHQVXUH WKHZRUNSURJUHVVRI WKHSURMHFWLVDOZD\VZLWKLQWKHSODQ7KH\PXV WPDQDJHQDQG FRQWUROWKHSURMHFWWRHQVXUHWKDWLWZLOO EHGOLYHUHGRQWLPH ZLWKLQWKHDJUHGGEXGJHWEDVHGRQWKHDSURY HGGHVLJQWKDW FRPSOLHV ZLWK WKH FRGHV DQG VWDQGDUGV WR PHHW WKH FOLHQW\V QHHGV DQG UHTXLUHPHQWV ZKLFK DUH WKH REMHFWLYHV RI WKH SURMHFW ,WZDVFRQILUPHGE\>@WKDWWKHUROHRIWKHFR QVWUXFWLRQ PDQDJHULVWRHILFLHQWO\DOGHFRQRPLFDOO\SS O\WKHUHTXLUHG UHVRXUFHV WR UHDO\JH WKH FRQVWUXFWHG IDFLOLW\ RI DFFHSWDEOH TXDOLW\ ZLWKLQ WKH WLPH IUDPH DQG EXGJHW FRVWV VSHFLILHG 6RPHFRPPRQUHVSQVLELOLWLHVRIQVWUXFWL RPDQDJHUFHQ EHFDFWHJRUL]HGDQGFODVVILHGDVSURMHFWPDQ DJPHQWSODQQLQJ VLWH PDQDJPHQW FRVW FRQWURO PDQDJPHQW UHVRXUFH PDQDJPHQW WLPH FRQWURO PDQDJPHQW PDWHULDO PDQDJPHQW TXDOLW\ DVVXUDQFH PDQDJPHQW FRQWUDFW PDQDJPHQWDQGGKHDOWKDQGVDIHW\PDQDJPHQ W&RQVWUXFWLRQ ILUPVRIDQRUJDQL]DWLRQXPVWWDYHFHUWDLQW\SH HVRISURFHVVHV RI HYDOXDWLQJ DQG SULRULWL]LQJ SURMHFWV WR HQDEOH WKHP WR LGHQWL\WKHUHTXLUHG UHVRXUFHVEDVHGRQWK HSULRULWLHVUHODWHG WR WKH WLPH FRVW DQG TXDOLW\ RI WKH SURMHFW 7KH SURMHFW PDQDJHUVKRXOGKDYHVSHFLILFVNLOOVLPDQDJH PHQWWDWPDNHV WKHPDEOHWRPDQDJHVKHSURFHVVRIPDWHULDOV VXEPLWDOVDQG DSSURYDOVDVWKLVSURFHVVUHTXLUHVFRQWLQX RXVIRORZXSQDQ FRRUGLQDWLRQZLWKWKHSURMHFWWHDPWRH[SH

GLWHSXUFKDVLPQJWKH DSSURYHG SURMHFW PDWHULDOV 5HIHQHQFH >@ FRQILUPHG WKDW RWKHU FDXVHV RI GHOD\ DUH DWWULEXWHG WR WKH LPSURSHU PDQDJPHQW RI PDWHULDOV DQG KDPSHUHG E\ WKH ODFN RI DQ H[SOLFWDQGGHWDLOPRGHORIWKHSURMHFWPDW HULDOVPDQDJPHQW SURFHVV6RPHRIWKHLPSRUWDQWWRROVOLNHUV RXUFHVSODQQLQJ DQG VFKHGXLQJ SURMHFW DFWLYLW\ SODQQLQJ DQG FRQWURO DUH LPSRUWDQW WRROV WKDW SURMHFWV PDQDJHUV DQG FRQVWUXFWLRQ PDQDJHUVVKRXOGDOZD\VSUDFWLFDQDGRSWEH IRUHWKHVWDUW WKH SURMHFW 0DQ\ SURMHFW PDQDJHUV IDLO WR PHHW SURMHFW GHDGOLQHV GXH WR WKH ODFN RI LQIRUPDWLRQ LQ PDQDJLQJ FRQVWUXFWLRQ SURMHFWV 7KH DSSURDFK RI SUHSDULQJ WKH PHWKRGRORJ\SODQE\WKHSURMHFWPDQDJHUDQGGK LVWHDPULRU WR ZRUN FRPPHQFHPHQW LV PRUH VXILFLHQW WKDQ VWDUWLQJ WKH LPPHGLDWHH[HFXLWRQSURFHVVHV9HULILQJFRQW UDFWGRFXPHQWV LQFOXGLQJ WKH ELOO RI TXDQWLWLHV DQG GUDZLQJ LV HVVHQWLDO WR DYRLG DQ\ FRQIOLFV RU GHOD\ 'HYHORSLQJ D SUHFLVH FRQVWUXFWLRQ PHWKRGRORJ\ KHOSV DOO SURMHFW SDUWLFLSDQWV PDLQO\ WKH FRQVWUXFWLRQ WHDP DQG WKHLU FRQVXOWDQWV WR RYHUFRPH DQ\ SRWHQWLDO SUREOHPV RU DQ\ LGHQWLILHG ULNVN LQ DGYDQFH

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FRQVWUXFWLRQ7KRPDV7HOIRUG/RQGRQ8.
0RKDPPHG \$+ DQG 6\$ 3&DXVHV RI 'HOD\ LQ /DUJH %XLOGLQJ
&RQVWUXFWLRQ 3URMHFW' -RXUQDO RI &RQVWUXFWLRQ
(QJLQHHULQJ
0DQDJPHQW9RO,VVXH1R3DJH

SODQ & 7ZRUV DQG - *RUGRQ &LYLO (QJLQHHULQJ 3URMHFW
0DQDJPHQW &RQVWUXFWLRQ PDQDJPHQW 3 ^{WK}HG
(OVHYLHU %XWWHUZRUVK+HLQHPDQ-
RUGDQ+LOO2[IRUG2;3
0DWW 6WHYHQ 7KH &RQVWUXFWLRQ 0%\$ 3UDFWLFDQ
\$\$SURDFKHV WR
&RQVWUXFWLRQ&RQWUDFWLQJ&KDSWHU0F*UDZ+LOO86\$
5LFKDUJ)DQG'DYLG/&RQVWUXFWLRQ0DQDJPHQWLQ3UDFW
LFH &RPPXQLFDWLRQV 3 &KDSWHU ^{WK} HG /RQJPDQ
6FLHQWLILF 7HFKQLFDQ8.
\$MLEDGH \$ DQG +HQ\ \$ 3&RQVWUXFWLRQ 'HOD\ DQG WKHLU
&DXVDWLYH)DFWRUV LQ 1LJHULD' -RXUQDO RI
&RQVWUXFWLRQ (QJLQHHULQJ DQG 3URMHFW
0DQDJPHQW9RO1R3DJH
6LGQH 0 /HY\ 3URMHFW0DQDJPHQW LQ
&RQVWUXFWLRQ
2UJDQLJLQJ3URMHFW7HDP3&KDSWHU^{WK}HG0F*UDZ+LOO86\$
+HQVH\ 0'(VVHQWLDQ7RROVRI7RWDQ4XDOLW\0DQDJPHQW'-
RXUQDORI &RQVWUXFWLRQ(QJLQHHULQJ
0DQDJPHQW9RO,VVXH3DJH
\$QNUDK1SDQG3URYHUEV'7UHDGLQJWKHVRIWHUDUHDVRI&0

FULWLFDO UHYLHZ RI FXOWXUH ,Q .KRVURZVKDKL)(G
WK \$QXDO \$5&20 &RQIHUHQFH 6HSHWPEHU +HUULRW
:DWW 8QLYHUVLW\
\$VVRFDLWLRQRI5HVHDUFKHUVLQ&RQVWUXFWLRQ0DQ
DJPHQW9RO
1HZ-HUVH\