中国计量科学研究院
National Institute of Metrology,China

010-64525678
www.nim.ac.cn

18

中国计量科学研究院
National Institute of Metrology,China

、, H

" eðiK¸ 8 8”K’,ï %-h¾GÙ(R^vD 5% ð0 8^#ð6 4V
7 0U-i6Ü7K 80U% ł?~/ß\œc$)OI IiK¸3e8æ4VPB>ÆE
1 , 0 % c7 $ " ·(Rg '“] ! µˆ,ï
0OL $“" ,¥N - > c$NPP4 Œ5%$ " ,¥\œc$)OI RR#ð
9 1 c$,¥’‰ K7 a0-“ %D#[%&\œc$9\# h 3e*µï)OI
(R"Ú℘ ! 5 0d"¢? ={c$,¥F $àø\# NPP4Ii# 3e#ô
0U-“*|pÕ6¯,<$k\œc$3Ø IiK¸
4(-“K˘gIF J (> c$RR#ðŒ#þ#ð÷Ò›# au üo$ Oü
P M¨7 8¥6î\œc$0U% 8b#öüo7 M L5
!61˜F ,¥iÛ4K&Ii4VPB%&#ðŒ3e8æ%+0ì/Ô0(Rg 0˜&"#ð
SI#ðœc$N # 3ìG Œ!2gæ =fFt%Ò'0
1 RfY LœG G /ß> c$5% ð%DhµGÙ@ ?å2gæ

F

}F}IR…S,

9 7 12

133 379

1717 450 1900

83

133

379

1900

1717

450

83

L { 7

5B¤âÐV(r

”　“　　”　“　　”　　BIPM

12

&„5B¤âæJÐ* - &¥5BK E2

BIPM

CCQM　　CCT　　CCT

APMP　　“ APMP　　”

“　　”

CIPM

CCT　APMP　　1　　CC　3　4

APMP　　2

APMP

APMP　　2021-2023　APMP　　“ APMP

”　　APMP

15　　1　　20

“

“　　”　　“

”

3　　45

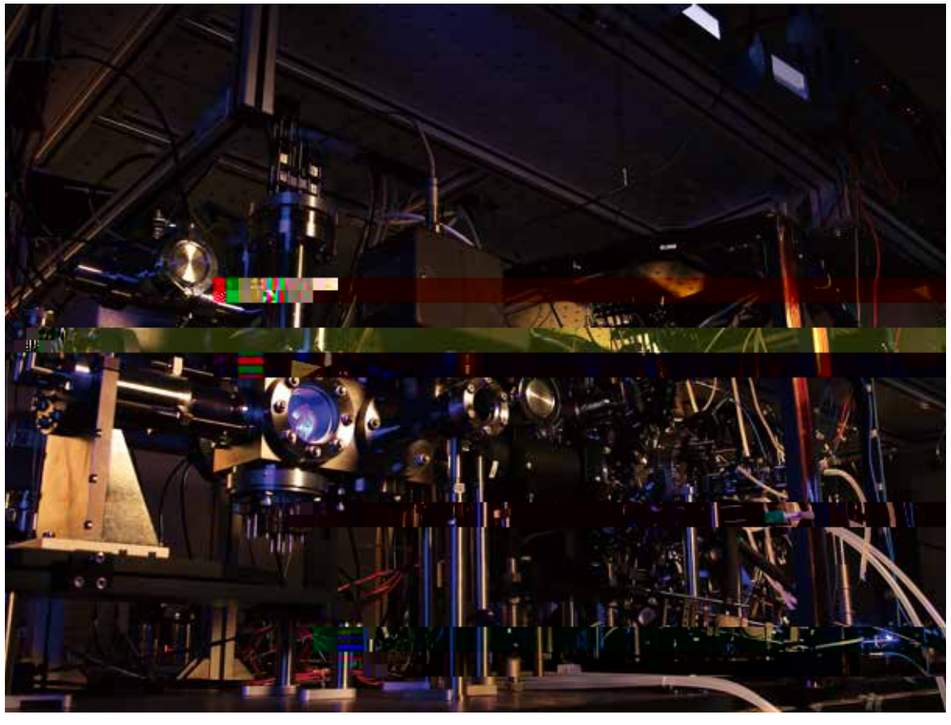
5B,;0V(r

‘ B

+Õ∂æGtU&„R¢Rßs2>A&—0 « m,&¥5B g˜L¿(Œ Rc. OEKo

2.9×10^{-17}

10^{-16}



P D ?7OÒP ’¿D 0 ä^ CÞæ
¡ 6˙p pGtUlíSSKo}o] h¡

234K~303K

T-T90

0.5mK~0.8mK

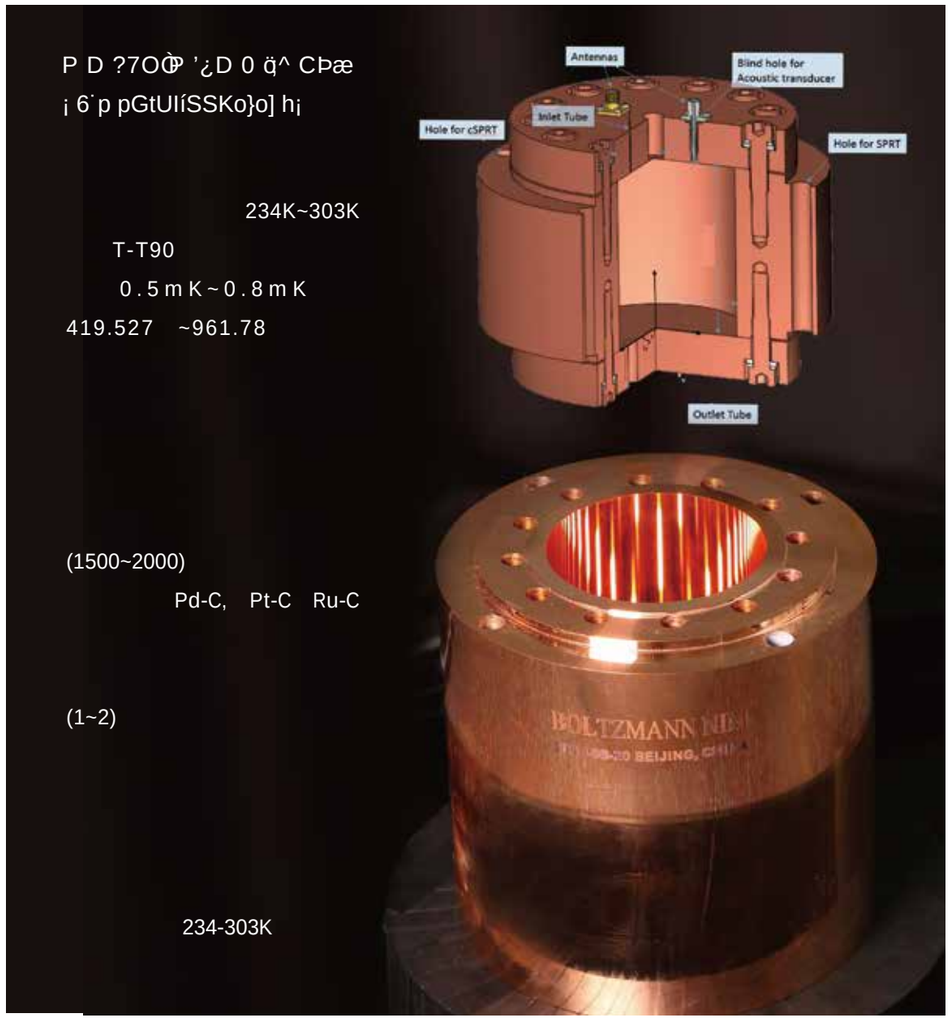
419.527 ~961.78

(1500~2000)

Pd-C, Pt-C Ru-C

(1~2)

234-303K



/ * . /i&xP /*+Ø‡5B¤â)Øöp`>A

2020

NIM-2

1.17×10^{-8} 4.49×10^{-8}

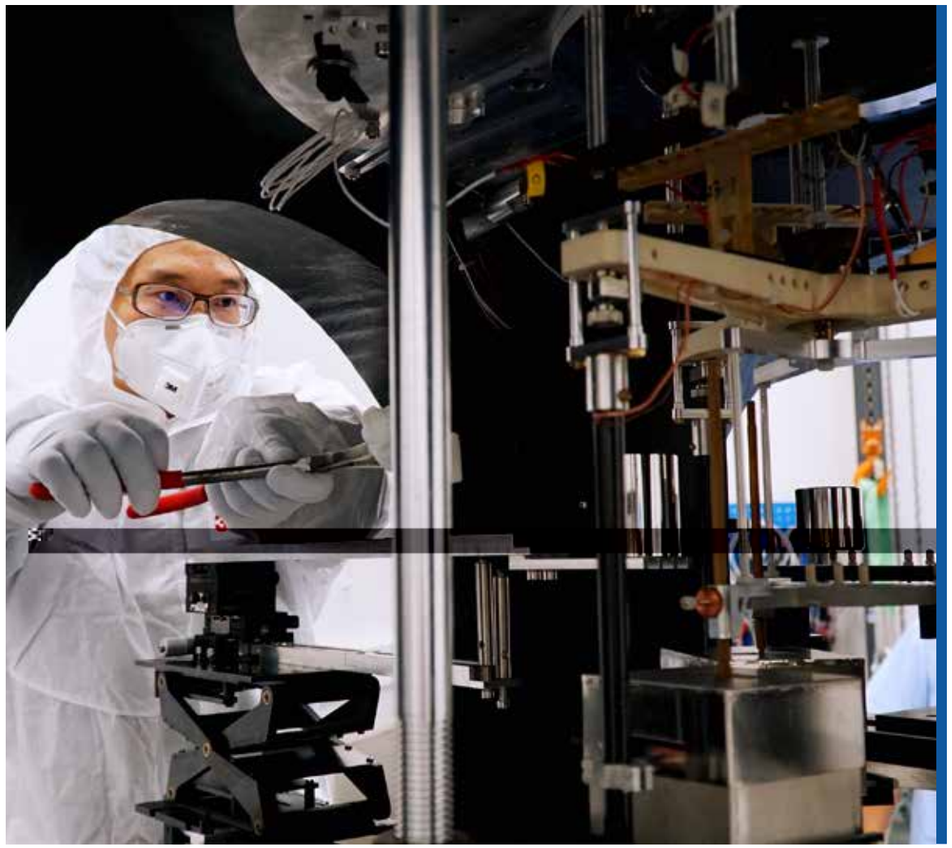
NRC NIST

10^{-8}

“ ”

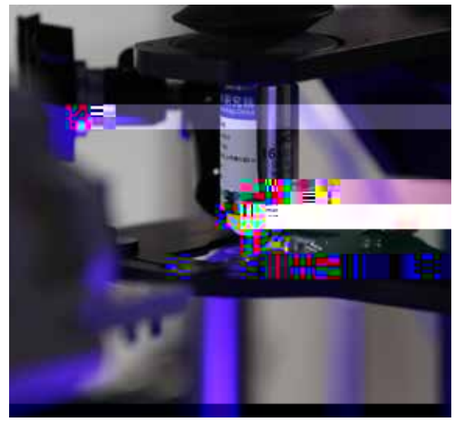
“ ”

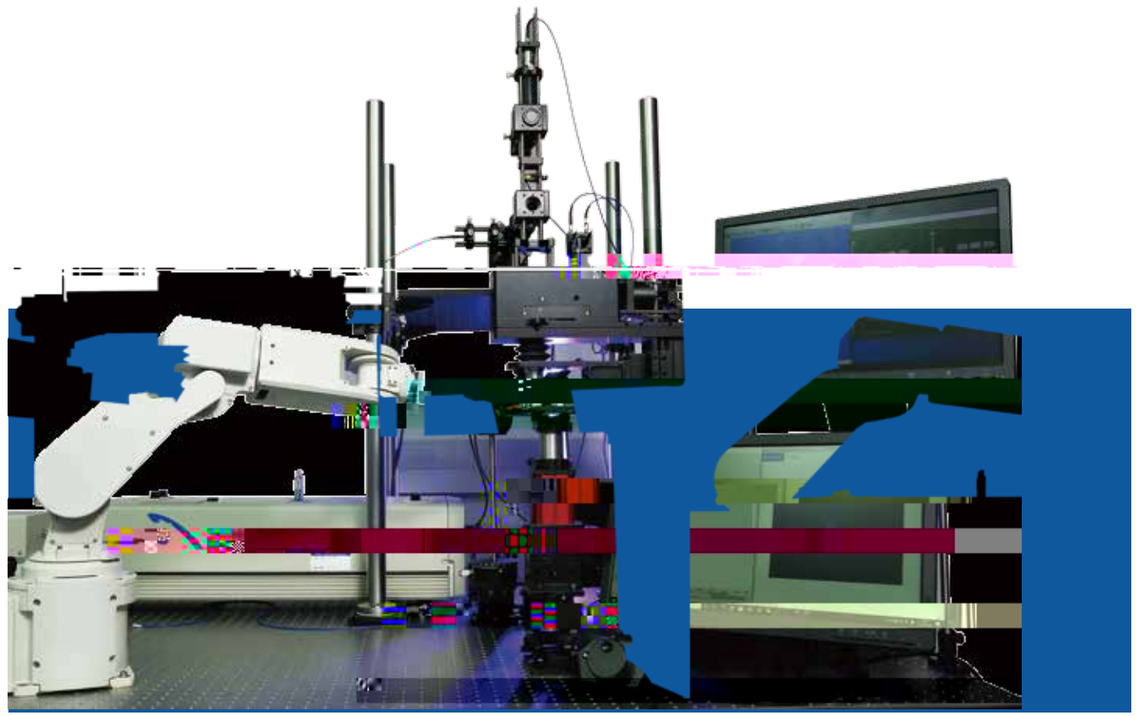
2021 2 1 “ ”



D u(/@+Ẽ'y5>]5¡ y„}aæL¿/.+Ẽ' æ

6˙p J.



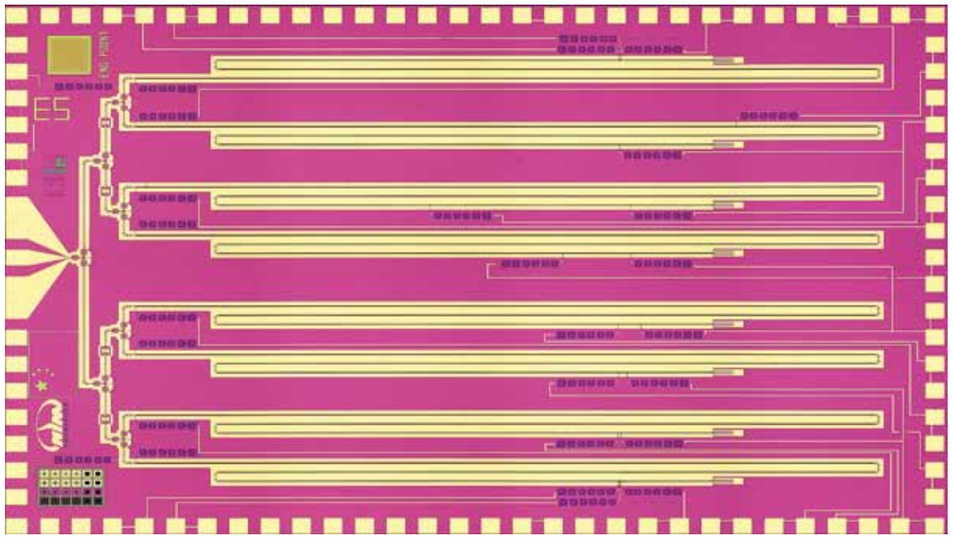


TMEæ¡ ='4<'Ý‰ s? &„03- 0 æSß,¥'¸Ií9->A6˙p

2V 7

4

TE9@+Ğ'Lr]54<'Ý



5B,;fi÷&¡) M D›+Ÿ‰[y¡ ='kO/ Sß,¥y„}apG-VIí.

NIST

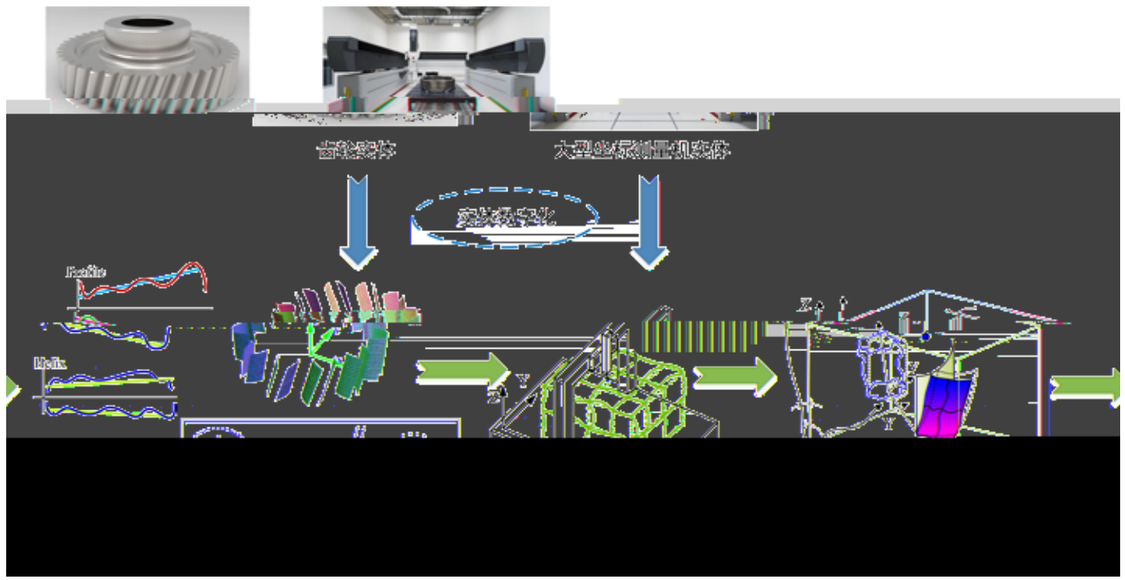
10^{-9}

10^{-6}

10^{-8}~10^{-9}

D“?•8Ð¹<œ°O¨=¶.Ê–æ¡€J®R©pGtU

PTB



K*? t_¤ kOqB5]5¡ J. æ̧ . [ü¤-V #’a& /.})

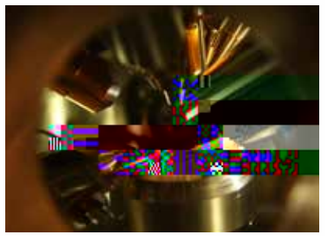
1GHz~40GHz 4m

PSA

}5x P RÞŒæ æD 0 Rj. ’a& P w uN

H ‡Ô2Þ u"´b æ

Ö P سخي



]. æy5,¥JÒæ}B'{' [Wk01 *4D

19

“ ”

27 500

&„Eæ p Nv›‹,I;&℃fl]5¡ L¿(Ø3« m,_w_B)B'{

C-

(CRP)

CRP

CRP

CRP

CRP

¤Æö5B¤â@(Y-Vææ 4 *æ&k&¡6¨R¥/@(Ym,>A&—1$,"y„D›

s2ææ T F D P O Eæ

SI s $\Delta\nu_{Cs}$

-133

Hz s^{-1}

9 192 631 770

1 s = 9 192 631 770 / $\Delta\nu_{Cs}$

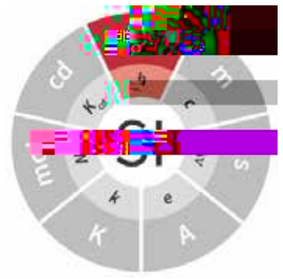
x ææ N F U S Fæ

SI m c

m/s 299 792 458

$\Delta\nu_{Cs}$

1 m = (c / 299 792 458) s



/*+ææ L J M P H S B Næ

SI kg

h J s $kg\ m^2\ s^{-1}$

$6.626\ 070\ 15 \times 10^{-34}$

c $\Delta\nu_{Cs}$

1 kg = (h/ 6.626 070 15 × 10 ^{34}) m^{-2} s

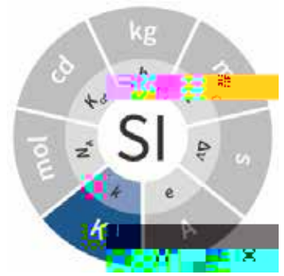
> 6˜ææ B N Q F S Fæ

SI A e

C As 1.602 176

634×10^{-19} $\Delta\nu_{Cs}$

1 A = (e/1.602 176 634 × 10^{-19}) s^{-1}

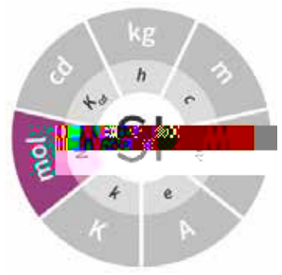


D ?7OÒææ L F M W J Oæ

SI K k $J\ K^{-1}$ $kg\ m^2\ s^{-2}\ K^{-1}$

$1.380\ 649 \times 10^{-23}$ h c $\Delta\nu_{Cs}$

1K = (1.380 649 /k) × 10^{-23} $kg\ m^2\ s^{-2}$



MÑ?7ææ N P M Fæ

SI mol 1

$6.022\ 140\ 76 \times 10^{23}$

mol^{-1}

N_A

n

1 mol = ($6.022\ 140\ 76 \times 10^{23}$) / N_A

5¿EÞK ææ D B O E F M Bæ

SI cd

540×10^{12}Hz

K_{cd} Im W^{-1} cd sr W^{-1} cd sr $kg^{-1}\ m^{-2}\ s^3$

683

h, c $\Delta\nu_{Cs}$

1 cd = (K_{cd} / 683) $kg\ m^2\ s^{-3}\ sr^{-1}$

www.bipm.org