



เอกสารอ้างอิง

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REQUESTED OPTIONS (EXECUTE): NODECK,NCLIST,SCURCE,SRCFLG,OPTIO),NDRMFLG

OPTIONS IN EFFECT: NCLIST NCMAP NXPPE NCCSTMT NODECK SCURCE TERM OBJECT FIXED NDRMFLG SRCFLG N)SY4
OPT(O) LANGLVL(77) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(60) CHARLEN(500) 30049

*.....1.....?.....?.....4.....5.....6.....7.....J

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C      MR. WTHAT SUTTIPAK 0215765
C      MAIN PROGRAM
C      OPTIMIZATION OF SINGLE CHANNEL PER CARRIER
C      SATELLITE REPEATER CHANNEL CAPACITY
C      SINGLE LEVEL SCPC/CFM SYSTEM DESIGN
ISN      1      COMMON/CTMF/ALFA,AC,UTB,EPPS,FLS,GTS,SAG,DL,UTB,GRK
ISN      2      COMMON/CRY/DB,DTX,GAS,CNU,CNJ,CIM,CAR
ISN      3      COMMON/CLY/RS(10)
ISN      4      COMMON/CBI/DIM0
ISN      5      COMPLEX RS
ISN      6      READ(5,10)PS,ALFA,FLS,EPPS,GTS,UTB,FRU,FRJ
ISN      7      10 FORMAT(F5.2,F3.2,6F12.5)
ISN      8      READ(5,15)PS(1),I=1,10)
ISN      9      15 FORMAT(10F8.5)
ISN     10      WRITE(6,16)PS,FLS,EPPS,GTS,UTB,FRU,FRJ
ISN     11      16 FORMAT(1H2,10X,'SATELLITE LOCATION',2X,F3.2,5X,'SATURATION FLUX',
*DENENSITY',2X,IPE13.5,5X,'DB/SQ.M',//,10X,'SATURATION ERP OF SATE
*LLITE',2X,IPE13.5,5X,'DB',5X,'G/T OF SATELLITE',2X,IPE13.3,5X,
*'DB',//,10X,'USABLE TRANSPONDER BANDWIDTH',2X,IPE13.5,5X,'MHZ',//,
*10X,'UPLINK FREQUENCY',2X,IPE13.5,5X,'HZ',5X,'DOWN LINK FREQUENCY'
*,2X,IPE13.5,5X,'HZ')
ISN     12      READ(5,13)FILAT,OPC
ISN     13      13 FORMAT(2F4.2)
ISN     14      WRITE(6,14)FILAT,OPC
ISN     15      14 FORMAT(//,10X,'ATTENUATION AT THE EDGE OF ADJACENT TRANSPONDER',2X,
*F5.2,2X,'DB',//,10X,'CPI EMISSION CONSTRAINED SHALL NOT EXCEED',2X,
*F6.2,2X,'DB BELOW SINGLE CARRIER AT SATURATION',//,10X,'OUTSIDE OF
*BAND FC PLUS AND MINUS 20 MHZ')
ISN     16      WRITE(6,17)ALFA
ISN     17      17 FORMAT(//,10X,'NONLINEAR CHARACTERISTICS OF TRANSPONDER',//,10X,
*SCALING FACTOR',2X,IPE12.5,//,10X,'COMPLEX COEFFICIENTS')
ISN     18      WRITE(6,18)(I,PS(1),I=1,10)
ISN     19      18 FORMAT(//,10X,'(RS',12,')' =',IPE13.5,2X,'+',IPE13.5)
ISN     20      WRITE(6,2)
ISN     21      2 FORMAT(//,12X,'BI',4X,'BI',7X,'C/143',5X,'C/L13',5X,'C/L17',//,11X,
*'(DB)',4X,'(DB)',7X,'(DB)',2I6X,'(DB)',//)
ISN     22      AC=-4
ISN     23      BID=0.
ISN     24      DO 19 I=1,21
ISN     25      IF(I.EQ.1)GO TO 21
ISN     26      BID=BID-1.
ISN     27      BI=10.*I(BID/10.)
ISN     28      CALL FNCT2(BI,RO,ALFA,CTM,C143,C145)
ISN     29      WRITE(6,23)BI,RO,C143,C145,CIM
ISN     30      23 FORMAT(//,10X,F4.0,4(13X,F7.3))
ISN     31      19 CONTINUE
ISN     32      88 READ(5,1,END=99)KCRF
ISN     33      1 FORMAT(12)
ISN     34      READ(5,4)PDI,PNI,CP1,AC
ISN     35      4 FORMAT(4F3.1)
ISN     36      READ(5,5)CSP,CBW,PEF

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แบบจัดการทรัพยากรกำลังแบบระดับเดียว
โปรแกรมการคำนวณ SCPC/CFM

ภาคผนวก ก.

ศูนย์วิทยทรัพยากร มหาวิทยาลัย

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ISN      37      5 FORMAT(2F5.0)
ISN      38      READ(5,20)PE1,PE2,GT5
ISN      39      20 FORMAT(2F5.2)
ISN      40      READ(5,12)TTN,SMAR
ISN      41      12 FORMAT(2F4.2)
ISN      42      IF(KCODE-2)299,288,299
ISN      43      288 READ(5,215)RT
ISN      44      315 FORMAT(F4.2)
ISN      45      299 WL=2.F+C8/FRU
ISN      46      WLD=2.E+C8/FRD
ISN      47      WW=PE2-PS
ISN      48      WW=2.14159*WW/1PC
ISN      49      WY=2.14159*PE1/1PC
ISN      50      WR=COS(WW)*COS(WY)
ISN      51      WR=-C.2954*WR+1.
ISN      52      DT=42644.*SQRT(WR)
ISN      53      DL=2C.*(ALOG10(FRC/1.E+C6)+ALOG10(DT))+32.+5
ISN      54      UL=2C.*(ALOG10(FRU/1.F+C6)+ALOG10(DT))+32.+5
ISN      55      GAU=1C.*(ALOG10(WL*W1/(4.*3.14159)))
ISN      56      WRITE(6,40)CSP,CBH,AC,FFD,PDI,PWT,CPI
ISN      57      40 FORMAT(//,10X,'CHANNEL SPACING',2X,1PE13.5,5X,'HZ',5X,'IF BANDWIDTH
*H',2X,1PE12.5,5X,'ACTIVITY FACTOR',1PE13.5,/,10X,'PEAK FREQUENCY
*DIVIATION',2X,1PE13.5,2X,'HZ',5X,'EMPHASIS IMPROVEMENT',2X,1PE13.5
*,2X,'DB',/,10X,'WEIGHTING IMPROVEMENT',2X,1PE13.5,2X,'DB',5X,'COMP
*ANDOR IMPROVEMENT',2X,1PE13.5,2X,'DB')
ISN      58      CNRR=TTN-CPI-PDI-PWT-2C.*(ALOG10(FFD))+104.10
ISN      59      WRITE(6,7)TTN,CNRR
ISN      60      7 FORMAT(//,10X,'REQUIRED TTN',F8.2,3X,'DB',/,10X,'REQUIRED CIR',F8.2
*,3X,'DB')
ISN      61      THD=1C.*(ALOG10(35.*SQRT(1.4E+06)+SQRT((C34/2.-3400)/3+05.))
ISN      62      TMAR=CNRR-THD
ISN      63      IF(TMAR.GE.SMAR)GO TO 75
ISN      64      TSET=SMAR-TMAR
ISN      65      CNRR=CNRR+TSET
ISN      66      TTN=CPI+PDI+PWT+2C.*(ALOG10(FFD))+CNRR-104.10
ISN      67      TMAR=SMAR
ISN      68      75 WRITE(6,101)THD,CNRR,TMAR,TTN
ISN      69      101 FORMAT(//,10X,'CNR/TH',2X,F6.2,2X,'CNR FINAL REQUIRED',2X,F6.2,2X,
*,'THRESHOLD MARGIN',2X,F6.2,2X,'FINAL TTN',2X,F6.2)
ISN      70      WRITE(6,22)DT
ISN      71      22 FORMAT(//,10X,'DISTANCE BETWEEN E/S AND SATELLITE',F8.2)
ISN      72      WRITE(6,29)PE1,PE2,DL,UL
ISN      73      29 FORMAT(//,10X,'EARTH STATION LOCATION',2X,F10.5,'N',2X,F10.5,'E',
*,/,10X,'DOWN-LINK PATH LOSS',2X,F6.2,2X,'DB',5X,'JP-LINK PATH LOSS'
*,2X,F6.2,2X,'DB')
ISN      74      WRITE(6,25)
ISN      75      25 FORMAT(//,2X,'G/T',2X,1PE1,3X,'BOC',2X,1PE10,3X,'E.RPE',4X,
*,'CNU',5X,'CND',5X,'CIN',5X,'CNR',5X,'TTN',5X,'CIR',5X,'DIR',4X,
*,'DIMC',5X,'CPI',4X,'CSP',5X,'CBH',4X,'AC',11)
ISN      76      NT=17
ISN      77      DO 50 J=1,NT
ISN      78      GO TO(300,305,310)KCODE
ISN      79      300 BI=1.C
ISN      80      DO 42 I=1,2000
ISN      81      BI=BI+0.01
ISN      82      CALL FNCT1(01)

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ISN      83      IF(IZ.GT.1)GO TO 43
ISN      84      CNR1=CNR
ISN      85      BI1=BI
ISN      86      43 IF(CNR1.GE.CNR)GO TO 42
ISN      87      CNR1=CNR
ISN      88      BI1=BI
ISN      89      42 CONTINUE
ISN      90      CNR=CNR1
ISN      91      BI=BI1
ISN      92      GO TO 320
ISN      93      305 CALL FNCT1(BI)
ISN      94      OBI=DIME+IC.*ALOGIC(4.E+C3)-FILAI
ISN      95      GO TO 320
ISN      96      310 BI=B.C
ISN      97      DD 65 IS=1,1000
ISN      98      BI=BI+C.C1
ISN      99      CALL FNCT1(BI)
ISN      100     OBI=DIME+IC.*ALOGIC(4.E+C3)-FILAI
ISN      101     COMP=EIRPS-OBI
ISN      102     IF(COMP.GE.DRC)GO TO 320
ISN      103     65 CONTINUE
ISN      104     320 EIRPS=C.C
ISN      105     CALL FNCT1(BI)
ISN      106     OBI=DIME+IC.*ALOGIC(4.E+C3)-FILAI
ISN      107     CALL FNCT2(EIRPS,BI)
ISN      108     EIRPS=CARR-CNR
ISN      109     CALL FNCT2(EIRPS,BI)
ISN      110     EIRPE=EIRPS-GAS+GAL+UL+C.5
ISN      111     TTN=CPI+PDI+PNI+20.*ALOGIC(PFI)+CNR-104.13
ISN      112     TOTAL=IC.*(EIRPS-PE)-EIRPS/IC.)
ISN      113     ITOT=IFIX(TOTAL)
ISN      114     TOTAL=FLOAT(ITOT)
ISN      115     TCH=TOTAL/AC
ISN      116     ITCH=IFIX(TCH)
ISN      117     TCH=FLOAT(ITCH)
ISN      118     BLIM=UTE/CSP
ISN      119     IBLIM=IFIX(BLIM)
ISN      120     BLIM=FLOAT(IBLIM)
ISN      121     WRITE(5,26)GTE,BI,PC,EIRPS,EIRPE,CNR,CNI,CIM,TTN,GAS,DIM,DIUJ,
      *OBI,TOTAL,TCH,BLIM
ISN      122     26 FORMAT(1,2X,F4.1,F7.2,F6.2,2F7.2,5F8.2,2F8.1,F7.1)
ISN      123     GTE=GTE+1.
ISN      124     50 CONTINUE
ISN      125     GO TO 98
ISN      126     99 STOP
ISN      127     END
    
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STATISTICS SOURCE STATEMENTS = 127, PROGRAM SIZE = 3584 BYTES, PROGRAM NAME = MAIN PAGE: 1.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 1 *****

OPTIONS IN EFFECT: NOLIST NCMAP NOXREF ACCOSTMT NODECK SOURCE TERM OBJECT FIXED NOJTEST NOTRMFLG SRCFLG NDSYM
 OPT(10) LANGVL(77) ACCIPS FLAS(11) NAME(MAY) LINECOUNT(80) CHARLEN(300) SDDP

..........1.....2.....3.....4.....5.....6.....7.....*

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ISN      1      SUBROUTINE FNCT1(DD)
ISN      2      COMMON/CTMFA/ALFA,AC,UTP,ERPS,FLS,GTS,CAU,DL,GTE,BUMR
ISN      3      COMMON/CPX/BC,DTM,GAS,CNU,CND,CIV,CAR
ISN      4      COMMON/CIY/YS(10)
ISN      5      COMMON/CP1/DIMQ
ISN      6      COMPLEX BS,ZUM1,ZUM2,ZUM3,ZU4
ISN      7      BI=BB
ISN      8      BI=10.*Y*(BI/10.)
ISN      9      BI=1./BI
ISN     10      S=C.C
ISN     11      ZUM1=(0,C)
ISN     12      ZUM2=(0,C)
ISN     13      ZUM3=(0,C)
ISN     14      DO 1 I=1,10
ISN     15      S=S+1
ISN     16      ZUM=BS*(Y)+S*EXP(-(ALFA**2)*(S**2)*BI/2.)
ISN     17      ZUM1=ZUM1+ZUM
ISN     18      ZUM=ZUM*(S*S)
ISN     19      ZUM2=ZUM2+ZUM
ISN     20      ZUM=ZUM*(S*S)
ISN     21      ZUM3=ZUM3+ZUM
ISN     22      CAR=CARS(ZUM1)
ISN     23      CAR=CAR**2
ISN     24      TRD=CARS(ZUM2)
ISN     25      TRD=TRD**2
ISN     26      FIF=CARS(ZUM3)
ISN     27      FIF=FIF**FIF
ISN     28      CAP=10.*ALOG10(CAR)
ISN     29      TRD=10.*ALOG10(TRD)
ISN     30      FIF=10.*ALOG10(FIF)
ISN     31      CIM=10.*ALOG10(32./(12.*(ALFA**4)))
ISN     32      CIM5=10.*ALOG10(36864./(115.*(ALFA**3)))
ISN     33      BIN=10.*ALOG10(BI)
ISN     34      BBO=CAR+10.*ALOG10(ALFA*ALFA/4.)+BIN
ISN     35      CIM3=CIM+CAR-2.*BIN-TRD
ISN     36      CIM5=CIM5+CAR-4.*BIN-FIF
ISN     37      CIM=1./((1./(10.*CIM2/10.)))+(1./(10.*CIM5/10.))
ISN     38      CIM=10.*ALOG10(CIM)
ISN     39      BIN=ABS(BIN)
ISN     40      BBO=ABS(BBO)
ISN     41      BO=BRF
ISN     42      CM=CIM+10.*ALOG10(1.78)
ISN     43      DIM=ERPS-BBO-CM
ISN     44      CIB=CIM3+2.34
ISN     45      C15=CIM5+2.1
ISN     46      CIT=1./((1./(10.*CIB/10.)))+(1./(10.*C15/10.))
ISN     47      CIT=10.*ALOG10(CIT)
ISN     48      CITI=CIT+10.*ALOG10(40.F+06)
ISN     49      DIMQ=ERPS-BBO-CITI
ISN     50      GAS=ERPS-BBO-FLS+BIA
ISN     51      CNU=FLS-BIN+GTS+CAL+228.6
ISN     52      CND=ERPS-BO-DL+GTE+228.6-C.3
ISN     53      CIM=CM

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ศูนย์วิทยทรัพยากร
 ภาควิชาคณิตศาสตร์
 มหาวิทยาลัยเกษตรศาสตร์

LEVEL 1.3.C (MAY 1983)

VS FORTRAN

DATE: MAY 11, 1984

TIME: 17:43:21

NAME: FNCT1

PAGE: 5

*.....1.....2.....3.....4.....5.....6.....7.....8.....9

ISN	54	CNR=+1./((1./((1./((1C.**((CND/1C.))) + (1./((1C.**((CND/1C.))) + (1./((1C.**((CND/1C.))) + (1./((1C.**((CND/1C.)))
ISN	55	*M/1C.1)))
ISN	56	CNR=1C.*ALOGIC(CNR)
ISN	57	RETURN
		END

STATISTICS SOURCE STATEMENTS = 57, PROGRAM SIZE = 4278 BYTES, PROGRAM NAME = FNCT1 PAGE: 4.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 2 *****

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

OPTIONS IN EFFECT: NOLIST NEMAP NOXREF NOGOSTMT NOJDECK SOURCE TERM OBJECT FIXED NOJTEST NOJTRMPLG SRCPLG NOJSYM
OPT(0) LANGLVL(77) ACIFPS FLAG(1) NAME(MAIN) LINECJUNT(50) CHARLEN(500) SJJMP

.....1.....2.....3.....4.....5.....6.....7......3

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ISN 1 SUBROUTINE FNCT3(R1,BFC,ALFA,C14,C15,C15)
ISN 2 COMMON/CLX/RS(10)
ISN 3 COMPLEX BS,ZUM1,ZUM2,ZUM3,ZU4
ISN 4 S=C.0
ISN 5 ZUM1=(C,C)
ISN 6 ZUM2=(C,C)
ISN 7 ZUM3=(C,C)
ISN 8 DO 1 I=1,10
ISN 9 S=S+1
ISN 10 ZUM=BS(I)*S*EXP(-(ALFA**2)*(S**2)**1/2.)
ISN 11 ZUM1=ZUM1+ZUM
ISN 12 ZUM=ZUM*(S**2)
ISN 13 ZUM2=ZUM2+ZUM
ISN 14 ZUM=ZUM*(S*S)
ISN 15 1 ZUM3=ZUM3+ZUM
ISN 16 CAR=CABS(ZUM1)
ISN 17 CAR=CAR**2
ISN 18 TRD=CABS(ZUM2)
ISN 19 TRD=TRD**2
ISN 20 FIF=CABS(ZUM3)
ISN 21 FIF=FIF**2
ISN 22 CAR=10.*ALOG10(CAR)
ISN 23 TRD=10.*ALOG10(TRD)
ISN 24 FIF=10.*ALOG10(FIF)
ISN 25 CMI=10.*ALOG10(32./12.*(ALFA**4)))
ISN 26 CMI5=10.*ALOG10(36884./1113.*(ALFA**9)))
ISN 27 BIN=10.*ALOG10(B1)
ISN 28 BBO=CAR*10.*ALOG10(ALFA*ALFA/4.)+BIN
ISN 29 CIM2=CMI+CAR-2.*BIN-TRD
ISN 30 CIM5=CMI5+CAR-4.*BIN-FIF
ISN 31 CIM=1./((1./10.**((CIM2/10.)))+(1./10.**((CIM5/10.))))
ISN 32 CIM=10.*ALOG10(CIM)
ISN 33 RETURN
ISN 34 END

```

STATISTICS SOURCE STATEMENTS = 34, PROGRAM SIZE = 2782 BYTES, PROGRAM NAME = FNCT3 PAGE: 6.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 3 *****

LEVEL 1.3.C (MAY 1983)

VS FORTRAN

DATE: MAY 11, 1984

TIME: 17:45:22

PAGE: 7

OPTIONS IN EFFECT: NOLIST NCMAP NOXREF NOCESTMT NODECK SOURCE TERM SUBJECT FIXED NOTEST NOTRMFLG SRCFLG NOSYM
 OPT(0) LANGLVL(77) ACFIPS FLAG(1) NAME(4IN) LINECOUNT(50) CHARLEN(500) 5)JMP

.......1.....2.....2.....4.....5.....5.....7,*.}

```

ISN      1      SUBROUTINE FNCT2(EIRPS,BI)
ISN      2      COMMON/CTMF/ALFA,AC,UTB,EPPS,FLS,GIS,GAL,DL,STE,CNRR
ISN      3      COMMON/CPY/BN,DTM,GAS,CNU,CND,CIM,CNR
ISN      4      CNU=EIRPS-GAS+GTS+GAU+228.6
ISN      5      CND=EIRPS-OL+STE+228.6-C.3
ISN      6      CIM=EIRPS-CIM
ISN      7      CNR=+1./((1./((10.** (CAU/10.))) + (1./((10.** (CND/10.))) + (1./((10.** (CI
          *M/10.)))))
ISN      8      CNR=10.*ALG10(CNR)
ISN      9      RETURN
ISN     10      END

```

STATISTICS SOURCE STATEMENTS = 10, PROGRAM SIZE = 1040 BYTES, PROGRAM NAME = FNCT2 PAGE: 7.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 4 *****

ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย

REQUESTED OPTIONS (EXECUTE): NNODECK,NOLIST, SOURCE, SRCFL3,DP(10),NUTR4FL3

OPTIONS IN EFFECT: NOLIST NCMAP NCMREF NCMSTMT NNODECK SOURCE TERM SUBJECT FIXED NUTEST NUTR4FL3 SRCFL3 DSYM
OPT(C) LANGLVL(77) NCFIPS FLAS(1) NAME(MAIN) LANEJUNT(60) CHARLEN(500) SDDP

.....1.....2.....3.....4.....5.....6.....7......3

```

C MAIN PROGRAM
C OPTIMIZATION OF SINGLE CHANNEL PER CARRIER
C SATELLITE REPEATER CHANNEL CAPACITY
C MULTILEVEL SCPC/CFM SYSTEM DESIGN
ISN 1 DIMENSION GT(5),PP(5),R(5),CS(5),XC(5),J(5),CE(5,5),CAN(5),
*CXU(5),CND(5),CXI(5)
ISN 2 COMMON/CTMF/ALFA,AC,UTR,EPDS,FLS,GTS,GAJ,STE,CINR
ISN 3 COMMON/CRX/RC,DTM,GAS,CNU,CND,CIM,CAR
ISN 4 COMMON/CLU/CL,JUL
ISN 5 COMMON/CLX/RS(10)
ISN 6 COMMON/CRT/DTMD
ISN 7 COMPLEX RS
ISN 8 READ(5,10)PS,ALFA,FLS,EPDS,GTS,UT3,FRU,FRD
ISN 9 10 FORMAT(F5.2,F2.2,6F12.5)
ISN 10 READ(5,15)(BSIT),I=1,10)
ISN 11 15 FORMAT(10F8.5)
ISN 12 READ(5,13)FILAT,ORC
ISN 13 13 FORMAT(2F4.2)
ISN 14 READ(5,20)PE1,PE2,GTE
ISN 15 20 FORMAT(3F5.2)
ISN 16 WRITE(6,14)PS,FLS,EPDS,GTS,UT3,FRU,FRD
ISN 17 16 FORMAT(1H2,10X,'SATELLITE LOCATION',2X,F5.2,5X,'SATURATION FLUX',
* 'DENSITY',2X,1PE13.5,5X,'DB/SC.M',//,10X,'SATURATION EIRP OF SATE
*LLITE',2X,1PE13.5,5X,'DB',5X,'G/T OF SATELLITE',2X,1PE13.5,5X,
* 'DB',//,10X,'USABLE TRANSDUCER BANDWIDTH',2X,1PE13.5,5X,'MHZ',//,
*10X,'UPLINK FREQUENCY',2X,1PE12.5,5X,'HZ',5X,'DOWN LINK FREQUENCY',
*,2X,1PE12.5,5X,'HZ')
ISN 18 WRITE(6,14)FILAT,ORC
ISN 19 14 FORMAT(//,10X,'ATTENUATION AT THE EDGE OF ADJACENT TRANSDUCER',2X,
*F5.2,2X,'DB',//,10X,'CPI EMISSION CONSTRAINED SHALL NOT EXCEED',2X,
*F6.2,2X,'DB BELOW SINGLE CARRIER AT SATURATION',//,10X,'OUTSIDE OF
* BAND EQ PLUS AND MINUS 20 MHZ')
ISN 20 WRITE(6,17)ALFA
ISN 21 17 FORMAT(//,10X,'NONLINEAR CHARACTERISTICS OF TRANSDUCER',//,10X,
* 'SCALING FACTOR',2X,1PE12.5,//,10X,'COMPLEX COEFFICIENTS')
ISN 22 WRITE(6,19)(I,PS(I),I=1,10)
ISN 23 18 FORMAT(//,10X,'(BS',12,') =',1PE13.5,2X,'+J',1PE13.5)
ISN 24 WRITE(6,2)
ISN 25 2 FORMAT(//,12X,'BI',4X,'BC',7X,'C/I43',5X,'C/I45',5X,'C/INT',//,11X,
* '(DB)',4X,'(CR)',7X,'(DR)',2(6X,'(DE)'),//)
ISN 26 AC=.4
ISN 27 BTD=0.
ISN 28 DO 19 I=1,21
ISN 29 IF(I.FO.1)GO TO 21
ISN 30 BID=BI(I-1.
ISN 31 21 BI=10.+(BIC/10.)
ISN 32 CALL FNCT3(BI,BO,ALFA,CIV,CI43,CI45)
ISN 33 WRITE(6,23)RC,RC,CI42,CI45,CIM
ISN 34 23 FORMAT(//,10X,F4.0,4(2X,F7.3))
ISN 35 19 CONTINUE
ISN 36 BI=8.0

```

แบบจัดการทรัพยากรสัญญาณแบบหลายระดับ
รูปแบบการการคำนวณระบบ SCPC/CFM
ภาคผนวก ข.



*.....1.....2.....3.....4.....5.....6.....7.....8

```

ISN      37      DO 65 IS=1,1000
ISN      38      BI=BI+.01
ISN      39      CALL FNCT1(91)
ISN      40      OBI=OBI+.1C.*ALOG10(4.E+03)-FILAT
ISN      41      COMP=EPFS-OBI
ISN      42      IF(COMP.GE.000)GO TO 66
ISN      43      65 CONTINUE
ISN      44      88 READ(5,1,END=59)N
ISN      45      1  FORMAT(1Z)
ISN      46      READ(5,3)(GT(I),RR(I),P(I),I=1,N)
ISN      47      3  FORMAT(1ZF3.1)
ISN      48      READ(5,4)PDI,PWI,CPI,AC
ISN      49      4  FORMAT(4F3.1)
ISN      50      READ(5,5)CSP,CRW,PCF
ISN      51      5  FORMAT(3F5.0)
ISN      52      READ(5,12)TTN,SMAR
ISN      53      12 FORMAT(2F4.2)
ISN      54      WL=2.E+08/FRU
ISN      55      WLD=3.E+08/FRU
ISN      56      WW=PE2-PE
ISN      57      WY=3.14159*PE1/1FC.
ISN      58      WW=3.14159*WW/1FC.
ISN      59      WR=COS(WW)*COS(WY)
ISN      60      WR=-C.2554*WR*1.
ISN      61      DT=42644.*SQRT(WP)
ISN      62      DL=2C.*(ALOG10(FRD/1.F+C6)+ALOG10(OT1))+32.+5
ISN      63      UL=2C.*(ALOG10(FRU/1.F+C6)+ALOG10(OT1))+32.+5
ISN      64      GAU=1C.*ALOG10(WL*WLD/(4.*3.14159))
ISN      65      WRITE(6,29)PE1,PE2,FL,UL
ISN      66      29 FORMAT(//,10X,'EARTH STATION LOCATION',2X,F10.5,' I',2X,F10.5,' E',
        *//,1CX,'DOWN-LINK PATH LOSS',2X,F6.2,2X,' JJ',5X,'UP-LINK PATH LOSS'
        *,2X,F6.2,2X,' DB')

ISN      67      SRB=C.C
ISN      68      SGB=C.0
ISN      69      DO 111 IS=1,N
ISN      70      SRB=SRB+RR(IS)/R(IS)
ISN      71      111 SGB=SGB+RR(IS)/(R(IS)*(1C.*(STT(IS)/10.)))
ISN      72      GTE=1C.*ALOG10(SRB/SGB)
ISN      73      WRITE(6,40)CSP,CRW,AC,PCF,PDI,PWI,CPI
ISN      74      40 FORMAT(//,1CX,'CHANNEL SPACING',2X,1PE13.5,5X,' HZ',5X,' IF BANDWIDTH
        *H',2X,1PE13.5,5X,'ACTIVITY FACTOR',1PE13.5,/,10X,'PEAK FREQUENCY
        *DIVIATION',2X,1PE13.5,2X,' HZ',5X,'EMPHASIS IMPROVEMENT',2X,1PE13.5
        *,2X,' DB',/,10X,'WEIGHTING IMPROVEMENT',2X,1PE13.5,2X,' DB',5X,'COMP
        *ANDOR IMPROVEMENT',2X,1PE13.5,2X,' DB')

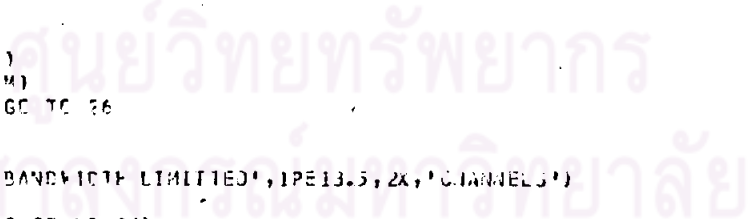
ISN      75      CNRP=TTN-CPI-PDI-PWI-2C.*ALOG10(PCF)+1C4.13
ISN      76      WRITE(6,7)TTN,CNRP
ISN      77      7  FORMAT(//,10X,'REQUIRED TTN',F8.2,3X,' DB',/,10X,'REQUIRED CNR',F8.2
        *,3X,' DB')

ISN      78      THD=1C.*ALOG10(35.*SQRT(7.4E+06)*SQRT((.34/2.-3+36)/3+30.))
ISN      79      TMAR=CNRP-THD
ISN      80      IF(TMAR.GE.SMAR)GO TO 75
ISN      81      TSET=SMAR-TMAR
ISN      82      CNRP=CNRP+TSET
ISN      83      TTN=CPI+PDI+PWI+2C.*ALOG10(PCF)+CNRP-1C4.13
ISN      84      TMAR=SMAR
ISN      85      75 WRITE(6,101)TTN,CNRP,TMAR,TTN
    
```

*.....1.....2.....3.....4.....5.....6.....7.....8.....9.....

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ISN      86      101 FORMAT(/,10X,'CNR/TH',2X,F6.2,2X,'CNR FINAL REQUIRED',2X,F6.2,2X,
          *'THRESHOLD MARGIN',2X,F6.2,2X,'FINAL TTN',2X,F6.2)
ISN      87      CALL FNCT1(BI)
ISN      88      OPB=BI
ISN      89      EIRPS=C.C
ISN      90      CALL FNCT2(EIRPS)
ISN      91      EIRPS=CNRB-CNR
ISN      92      CALL FNCT3(EIRPS)
ISN      93      WRITE(6,24)OPB,OC,C*U,CND,C14,CNR
ISN      94      24 FORMAT(/,10X,'OPTIMUM INPUT BACKOFF',2X,1PE13.5,2X,'DB',2X,'OPTIM
          *UM OUTPUT BACKOFF',2X,1PE13.5,2X,'DB',/,10X,'C14',2X,1PE13.5,2X,'
          *CND',2X,1PE13.5,2X,'DB',2X,'DIM',2X,1PE13.5,2X,'DB',2X,'CNR',2X,1P
          *E13.5,2X,'DB')
ISN      95      EIRPE=EIRPS-GAS+GAU+UL+C.5
ISN      96      WRITE(6,6)EIRPS
ISN      97      6 FORMAT(/,10X,'AVERAGE EIRP OF SATELLITE PER CARRIER',2X,F6.2,2X,
          *'DB')
ISN      98      WRITE(6,11)EIRPE
ISN      99      11 FORMAT(/,10X,'EIRP OF EARTH STATION PER CARRIER',F6.2,2X,'DB')
ISN      100     WRITE(6,9)DIM,GAS
ISN      101     9 FORMAT(/,10X,'INTERMODULATION NOISE DENSITY',F6.2,2X,'DB/Hz',/,10
          *X,'SATELLITE GAIN',F6.2,2X,'DB')
ISN      102     WRITE(6,115)DIMD
ISN      103     115 FORMAT(/,10X,'DIMD',1PE13.5)
ISN      104     WRITE(6,116)DBI
ISN      105     116 FORMAT(/,10X,'OUT OF BAND INTERMODULATION NOISE DENSITY',F6.2,2X,
          *'DB/4KHz')
ISN      106     TTN=CP1+PDI+PWI+20.*ALOG10(PFD)+CNR-104.10
ISN      107     WRITE(6,8)TTN
ISN      108     8 FORMAT(/,10X,'OPTIMUM TTN',F6.2,2X,'DB')
ISN      109     TOTAL=IC.**(((EIRPS-FC)-EIRPS)/10.)
ISN      110     ITOT=IFIX(TOTAL)
ISN      111     TOTAL=FLOAT(ITOT)
ISN      112     WRITE(6,27)TOTAL
ISN      113     27 FORMAT(/,10X,'NUMBER OF ACTIVE CHANNELS',1PE13.5)
ISN      114     TCH=TOTAL/AC
ISN      115     ITCH=IFIX(TCH)
ISN      116     TCH=FLOAT(ITCH)
ISN      117     WRITE(6,25)TCH
ISN      118     25 FORMAT(/,10X,'TRANSPONDER CHANNEL CAPACITY',2X,1PE13.5,2X,'CHANNE
          *LS')
ISN      119     BLIM=UTE/CSP
ISN      120     IDLIM=IFIX(BLIM)
ISN      121     BLIM=FLOAT(IDLIM)
ISN      122     IF(TCH.GT.BLIM)GO TO 26
ISN      123     GO TO 24
ISN      124     26 WRITE(6,28)IDLIM
ISN      125     28 FORMAT(/,10X,'BANDWIDTH LIMITED',1PE13.5,2X,'CHANNELS')
ISN      126     34 DO 120 JJ=1,N
ISN      127     CALL FNCT4(EIRPS,GT,XC,IJ)
ISN      128     120 R(IJ)=(10.**((XC(IJ)/IC.)))/(BI(IJ))*(10.**((XC(IJ)/10.)))
ISN      129     SUMJ=C.C
ISN      130     DO 125 JJ=1,N
ISN      131     125 SUMJ=SUMJ+R(IJ)*R(IJ)
ISN      132     CS(1)=(10.**((EIRPS/10.))/SUMJ)
ISN      133     DO 120 JX=2,N
    
```



.....1.....2.....3.....4.....5.....6.....7.....

```

ISN      134      130 CS(JX)=R(JX)*CS(1)
ISN      135              DO 135 JY=1,N
ISN      136      135 CS(JY)=10.*ALOG10(CS(JY))
ISN      137              DO 140 IX=1,N
ISN      138              CALL FUNCT5(CS,ST,CXA,CYL,CXD,CXI,IX)
ISN      139      140 CONTINUE
ISN      140              WRITE(6,60)GTF
ISN      141      60  FORMAT(/,10X,'G/T EQUIVALENT',2X,F5.2,2X,'DB')
ISN      142              WRITE(6,200)
ISN      143      200  FORMAT(/,10X,'TYPE',4X,'PR',5X,'R')
ISN      144              WRITE(6,220)(1,RR(I),R(I),I=1,N)
ISN      145      220  FORMAT(1(/,10X,12,4Y,F5.2,2X,F6.2))
ISN      146              DO 210 IM=1,N
ISN      147      210  R(IM)=10.*ALOG10(R(IM))
ISN      148              WRITE(6,200)
ISN      149              WRITE(6,220)(1,RR(I),R(I),I=1,N)
ISN      150              WRITE(6,230)
ISN      151      230  FORMAT(/,10X,'TYPE',4X,'G/T',5X,'CS',6X,'CNU',5X,'CND',5X,'CIN',
      *5X,'CNR')
ISN      152      2  WRITE(6,240)(1,GT(I),CS(I),CAX(I),CXD(I),CXI(I),CXN(I),I=1,N)
ISN      153      240  FORMAT(1(/,10X,12,2Y,6(2X,F6.2))
ISN      154              DO 250 IL=1,N
ISN      155              DO 250 IM=1,N
ISN      156      250  CF(IL,IM)=CS(IM)-GAS*GAL+UL*0.5
ISN      157              WRITE(6,260)
ISN      158      260  FORMAT(/,10X,'TABLE OF THE EARTH STATION EIRP FROM STATION TYPE I
      *TD TYPE J')
ISN      159              DO 270 I=1,N
ISN      160              WRITE(6,280)(CF(I,J),J=1,N)
ISN      161      270  CONTINUE
ISN      162      280  FORMAT(1(/,9X,5(2X,F5.2))
ISN      163              GO TO 99
ISN      164      99  STOP
ISN      165              END

```

STATISTICS SOURCE STATEMENTS = 165, PROGRAM SIZE = 12396 BYTES, PROGRAM NAME = MAIN PAGE: 1.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 1 *****

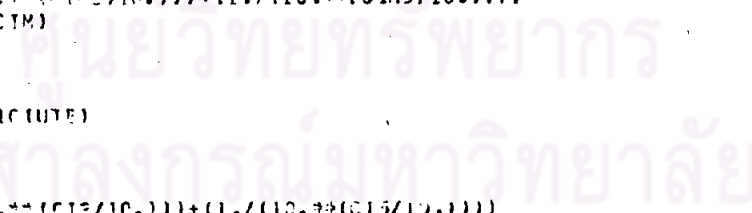
OPTIONS IN EFFECT: NOLIST NOMAP NOXREF NOGOSTMT NOJCK SOURCE TERM OBJECT FIXED NDTST NDTMFLS SRCFLD NLSYI
OPT(C) LANGLVL(77) NOFIPS FLAG(1) NAME(MAIN) LINESJUNT(50) CHARLEN(500) SJJ1*

......1.....2.....3.....4.....5.....6.....7.*.....8

```

ISN      1      SUBROUTINE FNCT1(BB)
ISN      2      COMMON/CTMF/ALFA,AC,UTB,ERPS,FLS,GTS,GAU,STE,CNR
ISN      3      COMMON/CRX/BD,DIM,GAS,CNU,CND,CIX,CAR
ISN      4      COMMON/CLU/DL,UL
ISN      5      COMMON/CLK/BS(10)
ISN      6      COMMON/CBI/DIM3
ISN      7      COMPLEX BS,ZUM1,ZUM2,ZUM3,ZUM
ISN      8      BI=BB
ISN      9      BI=10.*(BI/10.)
ISN     10      BI=1./BI
ISN     11      S=0.0
ISN     12      ZUM1=(C,C)
ISN     13      ZUM2=(10,C)
ISN     14      ZUM3=(C,C)
ISN     15      DO 1 I=1,10
ISN     16      S=S+1
ISN     17      ZUM=BS(I)*S*EXP(-(ALFA**2)*(S**2)*BI/2.)
ISN     18      ZUM1=ZUM1+ZUM
ISN     19      ZUM=ZUM*(S**2)
ISN     20      ZUM2=ZUM2+ZUM
ISN     21      ZUM=ZUM*(S*S)
ISN     22      ZUM3=ZUM3+ZUM
ISN     23      CAR=CAR*(ZUM1)
ISN     24      CAR=CAR**2
ISN     25      TRD=CAR*(ZUM2)
ISN     26      TRD=TRD**2
ISN     27      FIF=CAR*(ZUM3)
ISN     28      FIF=FIF**FIF
ISN     29      CAR=10.*ALOG10(CAR)
ISN     30      TRD=10.*ALOG10(TRD)
ISN     31      FIF=10.*ALOG10(FIF)
ISN     32      CM1=10.*ALOG10(32./12.*(ALFA**4))
ISN     33      CM15=10.*ALOG10(368**4./(115.*(ALFA**31)))
ISN     34      BIN=10.*ALOG10(BI)
ISN     35      BBO=CAR+10.*ALOG10(ALFA*ALFA/4.)*BIN
ISN     36      CIM3=CM1+CAR-2.*BIN-TRD
ISN     37      CIM5=CM15+CAR-4.*BIN-FIF
ISN     38      CIM=1./((1./((10.**CIM3/10.)))+(1./((10.**CIM5/10.))))
ISN     39      CIM=10.*ALOG10(CIM)
ISN     40      BIN=ABS(BIN)
ISN     41      BBO=ABS(BBO)
ISN     42      BO=BBO
ISN     43      CM=CIM+10.*ALOG10(UTE)
ISN     44      DIM=ERPS-BBO-CM
ISN     45      CI3=CIM3+3.74
ISN     46      CI5=CIM5+2.1
ISN     47      CIT=1./((1./((10.**CI3/10.)))+(1./((10.**CI5/10.))))
ISN     48      CIT=10.*ALOG10(CIT)
ISN     49      CITI=CIT+10.*ALOG10(40.E+06)
ISN     50      DIM3=ERPS-BBO-CITI
ISN     51      GAS=ERPS-BBO-FLS+BIN
ISN     52      CNU=FLS-BIN+GTS+GAU+228.6
ISN     53      CND=ERPS-BD-DL+GTE+228.6-C.3

```



LEVEL 1.3.C (MAY 1983)

VS FORTRAN

DATE: MAY 11, 1984

TIME: 13:13:00

NAME: FNCT1

PAGE: 6

.....1.....2.....3.....4.....5.....6.....7......8

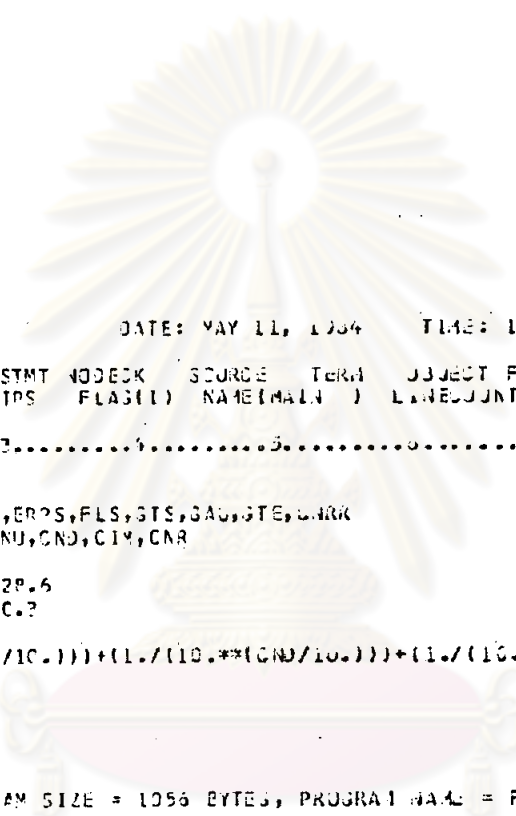
ISN	54	CIM=CM
ISN	55	CNR=+1./((1./10.** (CNU/10.)))+(1./10.** (CND/10.)))+(1./10.** (CI
		*M/10.)))))
ISN	56	CNR=1C.*ALOG10(CNR)
ISN	57	RETURN
ISN	58	END

STATISTICS SOURCE STATEMENTS = 58, PROGRAM SIZE = 4302 BYTES, PROGRAM NAME = FNCT1 PAGE: 5.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 2 *****

ศูนย์วิทยทรัพยากร
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LEVEL 1.3.C (MAY 1983)

VS FORTRAN

DATE: MAY 11, 1984

TIME: 13:13:07

PAGE: 7

OPTIONS IN EFFECT:	NOLIST	NOMAP	NOMREF	NOCOSTMT	NODECK	SOURCE	TERM	OBJECT	FIXED	NOTE ST	NOTRFLG	SRCFLG	ISYSM
	OPT(1)	LANGLV(77)	NCFIPS	FLAG(1)	NAME(MAIN)	LINEJUNT(60)	CHARLEN(500)	SOURCE					

*.....1.....2.....3.....4.....5.....6.....7.....8

ISN	1	SUBROUTINE FNCT2(FIRPS)
ISN	2	COMMON/CTHE/ALFA,AC,DTB,ERPS,FLS,GTS,JAG,STE,CNRK
ISN	3	COMMON/CRX/RO,DIM,GAS,CNU,CND,CIM,CNR
ISN	4	COMMON/CLU/DL,UL
ISN	5	CNU=FIRPS-GAS+GTS+CAL+229.6
ISN	6	CND=FIRPS-DL+STE+229.6-C.?
ISN	7	CIM=FIRPS-DIM
ISN	8	CNR=+1./((1./((1./((10.**((CNU/10.)))
		*M/10.)))
ISN	9	CNR=10.*ALCG10(CNR)
ISN	10	RETURN
ISN	11	END

STATISTICS SOURCE STATEMENTS = 11, PROGRAM SIZE = 1056 BYTES, PROGRAM NAME = FNCT2 PAGE: 7.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 3 *****

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OPTIONS IN EFFECT:	NOLIST	NOMAP	NOMREF	NOGOSTMT	NODECK	SOURCE	TERM	OBJECT	FIXED	NOTEST	NOJTRNPLG	SRCFLG	DSY1
	OPT(C)	LANGLV	(77)	NCFIPS	FLAG(I)	NAME(MAIN)	LINECOUNT(50)	CHARLEN(500)					SJJP

..........1.....2.....3.....4.....5.....6.....7.....8

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ISN      1      SUBROUTINE FNCT3(B1,BBC,ALFA,C1M,C1M3,C1M5)
ISN      2      COMMON/CLX/BS(10)
ISN      3      COMPLEX BS,ZUM1,ZUM2,ZUM3,ZUM
ISN      4      S=0.C
ISN      5      ZUM1=(0,C)
ISN      6      ZUM2=(0,C)
ISN      7      ZUM3=(0,C)
ISN      8      DO 1 I=1,10
ISN      9      S=S+1
ISN     10      ZUM=BS(I)*S*EXP(-(ALFA**2)*(S**2)*31/2.)
ISN     11      ZUM1=ZUM1+ZUM
ISN     12      ZUM=ZUM*(S**2)
ISN     13      ZUM2=ZUM2+ZUM
ISN     14      ZUM4=ZUM*(S+S1)
ISN     15      1 ZUM3=ZUM2+ZUM
ISN     16      CAR=CABS(ZUM1)
ISN     17      CAR=CAR**2
ISN     18      TRD=CABS(ZUM2)
ISN     19      TRD=TRD**2
ISN     20      FIF=CABS(ZUM3)
ISN     21      FIF=FIF*FIF
ISN     22      CAR=10.*ALOG10(CAR)
ISN     23      TRD=10.*ALOG10(TRD)
ISN     24      FIF=10.*ALOG10(FIF)
ISN     25      CM1=10.*ALOG10(32./(10.*(ALFA**4)))
ISN     26      CM15=10.*ALOG10(36664./(115.*(ALFA**8)))
ISN     27      BIN=10.*ALOG10(B1)
ISN     28      BBD=CAR+10.*ALOG10(ALFA*ALFA/4.)*BIN
ISN     29      C1M3=CM1+CAR-2.*BIN-TRD
ISN     30      C1M5=CM15+CAR-4.*BIN-FIF
ISN     31      C1M=1./((1./((10.**((C1M3/10.)))+1./((10.**((C1M5/10.))))))
ISN     32      C1M=10.*ALOG10(C1M)
ISN     33      RETURN
ISN     34      END

```

STATISTICS SOURCE STATEMENTS = 34, PROGRAM SIZE = 2782 BYTES, PROGRAM NAME = FNCT3 PAGE:

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 4 *****

LEVEL 1.3.C (MAY 1983)

VS F0PTF0A

DATE: MAY 11, 1984

TIME: 13:13:08

PAGE: 9

OPTIONS IN EFFECT: NOLIST NO MAP NO XREF NO COSTMT NO DECK SOURCE TERM SUBJECT FIXED NO TEST NO TRM FLS SRC FLS NO SYS1
 OPT(0) LANG LV(77) NO FIPS FLAG(1) NAME(MAIN) LINE(JUNT(60) CHARLEN(500) SOJIP

*.....1.....2.....3.....4.....5.....6.....7.....8.....9.....

```

ISN      1      SUBROUTINE FNCT4(EIRPS,CT,XC,IJ)
ISN      2      DIMENSION GT(5),XC(5)
ISN      3      COMMON/CTMF/ALFA,AC,UTB,EIRPS,FLS,GTS,GAL,STE,CNRR
ISN      4      COMMON/CRX/BO,CIN,GAS,CAL,CND,CIN,CAR
ISN      5      COMMON/ELU/DL,IJL
ISN      6      XCU=EIRPS-GAS+GTS+GAL+220.6
ISN      7      XCD=EIRPS-DL+GT(IJ)+220.6-0.3
ISN      8      XIM=EIRPS-DIM
ISN      9      XC(IJ)=1./((1./((10.**XCU/10.)))+(1./((10.**XCD/10.)))+(1./((10.**
ISN      10     *XIM/10.))))
ISN      11     XC(IJ)=10.*ALOG10(XC(IJ))
ISN      12     RETURN
ISN      13     END
  
```

STATISTICS SOURCE STATEMENTS = 12, PROGRAM SIZE = 1344 BYTES, PROGRAM NAME = FNCT4 PAGE: 9.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 5 *****

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LEVEL 1.3.0 (MAY 1983)

VS FORTRAN

DATE: MAY 11, 1994

TIME: 19:15:00

PAGE: 10

OPTIONS IN EFFECT: NOLIST NO MAP NO XREF NO COSTMT NO CHECK SOURCE TERM OBJECT FIXED NOTEST NOTRMFLS SRCPLS NOSY4
OPT(C) LANGLVL(77) NOFIPS FLAG(1) NAME(MAIN) LINEJUNT(50) CHARLEN(500) SJJ4P

......1.....2.....3.....4.....5.....6.....7.*.....3

```

ISN      1      SUBROUTINE FNCT5(ICS,GT,CXN,CXU,CXD,CXI,IX)
ISN      2      DIMENSION CS(5),GT(5),CXN(5),CXU(5),CXD(5),CXI(5)
ISN      3      COMMON/CTMF/ALFA,AC,CTP,CPPS,FLS,STS,GAU,GT6,CIRK
ISN      4      COMMON/CRX/BO,DTM,GAS,CAU,CND,CIM,CAR
ISN      5      COMMON/CLU/DL,HL
ISN      6      CXU(IX)=CS(IX)-GAS+STS+GAU+228.6
ISN      7      CXD(IX)=CS(IX)-DL+GT(IX)+228.6-0.3
ISN      8      CXI(IX)=CS(IX)-DIM
ISN      9      CXN(IX)=1./((1./(10.*(CXU(IX)/10.)))+(1./(10.*(CXD(IX)/10.)))+
ISN      10     *(1./(10.*(CXI(IX)/10.))))
ISN     11     CXN(IX)=10.*ALOG10(CXN(IX))
ISN     12     RETURN
ISN     13     END

```

STATISTICS SOURCE STATEMENTS = 12, PROGRAM SIZE = 1632 BYTES, PROGRAM NAME = FNCT5 PAGE: 10.

STATISTICS NO DIAGNOSTICS GENERATED.

***** END OF COMPILATION 6 *****

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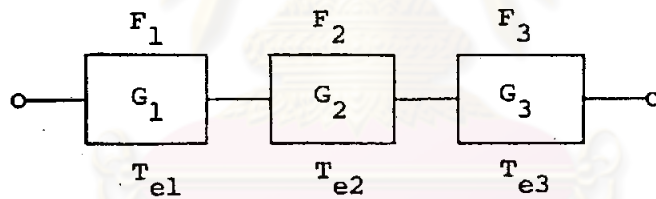


สำหรับอัตราขยายของสายอากาศ ณ ตำแหน่งอื่น ๆ ของสายอากาศสามารถหาค่าโดยการคำนวณจากภาคผนวก 28 ในข้อบังคับวิทยุ (Radio Regulations, International Telecommunication Union, Edition of 1982)

4. การคำนวณอัตราส่วนระหว่างอัตราขยายของสายอากาศต่ออุณหภูมิสัมมูลของเสียงรบกวนของระบบ (Gain to equivalent noise temperature of the system), G/T , ของสถานีภาคพื้นดิน

เทอม G/T ได้ถูกนำมาใช้เพื่อแสดง Figure of merit ของสถานีภาคพื้นดิน หรืออีกนัยหนึ่ง เพื่อแสดงสมรรถนะและความไวของระบบรับของสถานีภาคพื้นดิน

เสียงรบกวนในระบบรับของสถานีภาคพื้นดิน ประกอบด้วยเสียงรบกวนจากภายนอก และเสียงรบกวนที่เกิดจากอุปกรณ์ในระบบรับ เสียงรบกวนจากภายนอกได้แก่ Sky noise atmospheric noise และ ground noise เป็นต้น ส่วนเสียงรบกวนที่เกิดจากอุปกรณ์ในระบบรับได้แก่เสียงรบกวนที่เกิดจากสายส่งและเครื่องขยายเป็นต้น



รูปที่ ค.1 เครื่องขยายต่อแบบคาส์เคด

ในรูปที่ ค.1 สามารถหาอุณหภูมิสัมมูลของเครื่องขยายที่ต่อแบบคาส์เคด เมื่อพิจารณาที่จุดทางเข้าของเครื่องขยายเครื่องแรก ดังนี้

$$T_{et} = T_{e1} + \frac{T_{e2}}{G_1} + \frac{T_{e3}}{G_1 G_2} \quad (ค.5)$$

ในที่นี้

- T_{et} คือ อุณหภูมิสัมมูลของเสียงรบกวนของเครื่องขยายที่ต่อคาส์เคดกัน, $^{\circ}K$
- T_{e1}, T_{e2}, T_{e3} คือ อุณหภูมิของเสียงรบกวนของเครื่องขยายแต่ละเครื่อง, $^{\circ}K$
- G_1, G_2, G_3 คือ อัตราขยายของเครื่องขยายแต่ละเครื่อง

อุณหภูมิของเสียงรบกวนของ เครื่องขยายจะมีความสัมพันธ์กับ noise factor ของ เครื่องขยาย ดังนี้

$$T_e = (F - 1) T_o \quad (ค.6)$$

ในที่นี้

F คือ noise factor ของเครื่องขยาย ทั้งนี้

$$\text{noise figure} = 10 \log (F)$$

T_o คือ ambient temperature, °K

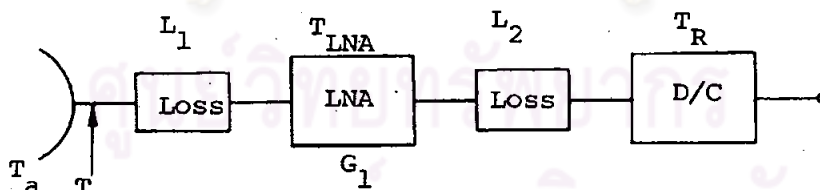
อุณหภูมิของเสียงรบกวนของอุปกรณ์ที่มีลักษณะสมบัติลดทอนกำลังของสัญญาณ จะมีความสัมพันธ์กับอัตราการลดทอนกำลังของสัญญาณ เมื่อพิจารณา ณ ด้านเข้าของอุปกรณ์ ดังนี้

$$T_L = (L_F - 1) T_o \quad (ค.7)$$

T_L คือ อุณหภูมิของเสียงรบกวนของอุปกรณ์ลดทอนกำลัง

L_F คือ อัตราการลดทอนกำลังของสัญญาณ

ในสภาวะที่ภาคพื้นดิน เสียงรบกวนส่วนใหญ่ จะเกิดจากอุณหภูมิของเสียงรบกวนของสายอากาศ, T_a , ที่รับมาจากภายนอก และอุปกรณ์ในระบบภาครับ ดังนี้



รูปที่ ค.2 แหล่งกำเนิดของเสียงรบกวนส่วนต่าง ๆ ของระบบ

ดังนั้นสามารถคำนวณหาอุณหภูมิสมมูลของเสียงรบกวนของระบบ, T_s , เมื่อพิจารณาที่จุดเชื่อมต่อของสายอากาศกับสายส่ง ได้ดังนี้

$$T_s = T_a + (L_1 - 1) T_o + L_1 T_{LNA} + \frac{L_1}{G_1} (L_2 - 1) T_o + \frac{L_1 L_2 T_R}{G_1} \quad (ค.8)$$

ในที่นี้

- T_a คือ อุณหภูมิของเสียงรบกวนของสายอากาศ ซึ่งคำนวณได้จากสมการที่ (4.1), $^{\circ}\text{K}$
- L_1 คือ อัตราการลดทอนกำลังของสัญญาณของสายส่งระหว่างข้อต่อของสายอากาศกับ Low noise amplifier
- T_{LNA} คือ อุณหภูมิของเสียงรบกวน ของ Low noise amplifier, $^{\circ}\text{K}$
- G_1 คือ อัตราขยายของ Low noise amplifier
- L_2 คือ อัตราการลดทอนกำลังของสายส่งระหว่าง Low noise amplifier กับ down converter รวมทั้งอุปกรณ์ power divider
- T_R คือ อุณหภูมิของเสียงรบกวนของ down converter

ขั้นตอนต่อไปจะทำการคำนวณหา G/T ของสถานีภาคพื้นดิน ได้ดังนี้

$$G/T = G - 10 \log (T_g) \quad (\text{ค.9})$$

ในที่นี้

- G/T คือ อัตราส่วนระหว่างอัตราขยายของสายอากาศต่ออุณหภูมิสัมมูลของเสียงรบกวนของระบบ, $\text{dB}/^{\circ}\text{K}$
- G คือ อัตราขยายของสายอากาศ, dB

ศูนย์วิทยุโทรพยากร
จุฬาลงกรณ์มหาวิทยาลัย

ประวัติผู้เขียน

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สำเร็จการศึกษาวิศวกรรมศาสตรบัณฑิต สาขาวิศวกรรม จากสถาบันเทคโนโลยี พระจอม
เกล้าวิทยาเขตเจ้าคุณทหาร ลาดกระบัง เมื่อปี พ.ศ. 2519 ต่อจากนั้นได้เข้ารับราชการ
ในกองบริการเครื่องจักรกล กรมอาชีวศึกษา เมื่อปี พ.ศ. 2520 ได้โอนมารับราชการที่
กรมไปรษณีย์โทรเลข ปัจจุบันทำงานในตำแหน่งนักวิชาการสื่อสาร 5 ประจำฝ่ายจัดระบบ
การสื่อสารพลเรือน กองแผนงาน กรมไปรษณีย์โทรเลข เคยเดินทางไปรับการศึกษาอบรมและดู
งานที่ประเทศอินโดนีเซีย อินเดีย ญี่ปุ่น และอิตาลี ตามลำดับ



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย