## Technical Data 6

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# Table of Rectangular Waveguide Standards

| Model | Frequency range (GHz) | JIS Standard | | | | | Frequency range (GHz) | EIAJ Standard | | | | Name of equivalent IEC Standard | MIL type description | AN type description | EIA type description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Nominal inner size (a × b) | Tolerance, Class 0 | Tolerance, Class 1 | Tolerance, Class 2 | Wall thickness | | EIAJ Model | Nominal inner size a × b | Tolerance, Precision class | Tolerance, Standard class | | | | |
| | | | | | | | 0.32~0.49 | WRI-3 | 584.2 ×292.1 | | | R3 | | | WR2300 |
| | | | | | | | 0.35~0.53 | WRI-4 | 533.4 ×266.7 | | | R4 | | | WR2100 |
| | | | | | | | 0.41~0.62 | WRI-5 | 457.2 ×228.6 | | | R5 | | | WR1800 |
| | | | | | | | 0.49~0.75 | WRI-6 | 381.0 ×190.5 | | | R6 | | | WR1500 |
| | | | | | | | 0.64~0.98 | WRI-8 | 292.10×146.05 | | | R8 | | | WR1150 |
| | | | | | | | 0.76~1.15 | WRI-9 | 247.65×123.82 | | | R9 | | | WR975 |
| | | | | | | | 0.96~1.46 | WRI-12 | 195.58×97.79 | | | R12 | | | WR770 |
| | | | | | | | 1.14~1.73 | WRI-14 | 165.10×82.55 | 0.25 | 0.33 | R14 | M85/1-017 | RG-69/U | WR650 |
| | | | | | | | 1.45~2.20 | WRI-18 | 129.54×64.77 | 0.19 | 0.26 | R18 | M85/1-023 | RG-337/U | WR510 |
| WRJ-2* | 1.70~ 2.60 | 109.220×54.610 | 0.11 | 0.16 | 0.20 | 2.03 | 1.72~2.61 | WRI-22 | 109.22×54.61 | 0.16 | 0.22 | R22 | M85/1-031 | RG-104/U | WR430 |
| | | | | | | | 2.17~3.30 | WRI-26 | 86.36 ×43.18 | 0.13 | 0.17 | R26 | M85/1-037 | RG-112/U | WR340 |
| WRJ-3 | 2.60~ 3.95 | 72.100×34.000 | 0.07 | 0.13 | | 2.00 | 2.60~3.95 | WRI-32 | 72.14 ×34.04 | 0.11 | 0.14 | R32 | M85/1-043 | RG-48/U | WR284 |
| WRJ-4 | 3.30~ 4.90 | 58.100×29.100 | 0.05 | 0.10 | | 1.60 | 3.22~4.90 | WRI-40 | 58.17 ×29.083 | 0.087 | 0.12 | R40 | M85/1-049 | RG-340/U | WR229 |
| WRJ-5 | 3.95~ 5.85 | 47.550×22.150 | 0.05 | 0.10 | | 1.60 | 3.94~5.99 | WRI-48 | 47.55 ×22.149 | 0.071 | 0.095 | R48 | M85/1-055 | RG-49/U | WR187 |
| WRJ-6 | 4.90~ 7.05 | 40.000×20.000 | 0.04 | 0.06 | $^{+0.06}_{-0.14}$ | 1.60 | 4.64~7.05 | WRI-58 | 40.39 ×20.193 | 0.061 | 0.081 | R58 | M85/1-061 | RG-343/U | WR159 |
| WRJ-7 | 5.85~ 8.20 | 34.850×15.850 | | 0.05 | $^{+0.05}_{-0.15}$ | 1.60 | 5.38~8.17 | WRI-70 | 34.85 ×15.799 | 0.052 | 0.07 | R70 | M85/1-067 | RG-50/U | WR137 |
| WRJ-9 | 7.05~10.00 | 28.500×12.600 | | 0.05 | $^{+0.05}_{-0.15}$ | 1.60 | 6.57~9.99 | WRI-84 | 28.499×12.624 | 0.043 | 0.057 | R84 | M85/1-073 | RG-51/U | WR112 |
| WRJ-10 | 8.20~12.40 | 22.900×10.200 | | 0.04 | $^{+0.04}_{-0.12}$ | 1.25 | 8.20~12.5 | WRI-100 | 22.86 ×10.16 | 0.04 | 0.046 | R100 | M85/1-079 | RG-52/U | WR90 |
| WRJ-120* | 9.84~15.00 | 19.050× 9.525 | | ±0.048 | | 1.27 | 9.84~15.0 | WRI-120 | 19.050×9.525 | 0.038 | 0.046 | R120 | M85/1-085 | RG-346/U | WR75 |
| WRJ-140* | 11.90~18.00 | 15.799× 7.899 | | ±0.031 | ±0.050 | 1.02 | 11.9~18.0 | WRI-140 | 15.799×7.899 | 0.031 | 0.046 | R140 | M85/1-089 | RG-91/U | WR62 |
| WRJ-180* | 14.50~22.00 | 12.954× 6.477 | | ±0.026 | ±0.045 | 1.02 | 14.5~22.0 | WRI-180 | 12.954×6.477 | 0.026 | 0.039 | R180 | M85/1-096 | RG-353/U | WR51 |
| WRJ-220* | 17.60~26.70 | 10.668× 4.318 | | ±0.021 | ±0.040 | 1.02 | 17.6~26.7 | WRI-220 | 10.668×4.318 | 0.021 | 0.032 | R220 | M85/1-102 | RG-53/U | WR42 |
| WRJ-260* | 21.70~33.00 | 8.636× 4.318 | | ±0.020 | ±0.035 | 1.02 | 21.7~33.0 | WRI-260 | 8.636 ×4.318 | 0.02 | 0.03 | R260 | M85/1-109 | RG-354/U | WR34 |
| WRJ-320* | 26.40~40.10 | 7.112× 3.556 | | ±0.020 | ±0.030 | 1.02 | 26.4~40.0 | WRI-320 | 7.112 ×3.556 | 0.02 | 0.03 | R320 | M85/3-008 | RG-271/U | WR28 |
| WRJ-400* | 33.00~50.10 | 5.690× 2.845 | | ±0.020 | ±0.030 | 1.02 | 32.9~50.1 | WRI-400 | 5.690 ×2.845 | 0.02 | 0.03 | R400 | M85/3-012 | RG-272/U | WR22 |
| WRJ-500* | 39.30~59.70 | 4.775× 2.388 | | ±0.020 | ±0.025 | 1.02 | 39.2~59.6 | WRI-500 | 4.775 ×2.388 | 0.02 | 0.03 | R500 | M85/3-016 | RG-358/U | WR19 |
| WRJ-620* | 49.90~75.80 | 3.759× 1.880 | | ±0.020 | ±0.025 | 1.02 | 49.8~75.8 | WRI-620 | 3.759 ×1.880 | 0.02 | 0.03 | R620 | M85/3-019 | RG-273/U | WR15 |
| WRJ-740* | 60.50~92.00 | 3.099× 1.550 | | ±0.020 | | 1.02 | 60.5~91.9 | WRI-740 | 3.099 ×1.549 | 0.02 | 0.03 | R740 | M85/3-022 | RG-274/U | WR12 |
| WRJ-900* | 73.80~112.00 | 2.540× 1.270 | | ±0.020 | | 1.02 | 73.8~112 | WRI-900 | 2.540 ×1.270 | 0.02 | 0.03 | R900 | M85/3-025 | RG-359/U | WR10 |
| WRJ-1200* | 92.30~140.00 | 2.032× 1.016 | | ±0.020 | | 1.02 | 92.2~140 | WRI-1200 | 2.032 ×1.016 | 0.02 | 0.03 | R1200 | M85/3-028 | | |
| | | | | | | | 114~173 | WRI-1400 | 1.651 ×0.826 | | | R1400 | M85/3-031 | | |
| | | | | | | | 145~220 | WRI-1800 | 1.295 ×0.648 | | | R1800 | M85/3-034 | | |
| | | | | | | | 172~261 | WRI-2200 | 1.092 ×0.546 | | | R2200 | M85/3-037 | | |
| | | | | | | | 217~330 | WRI-2600 | 0.864 ×0.432 | | | R2600 | M85/3-040 | | |

Note: Items marked by ※ are for the EIAJ Standard (former CES Standard).

## Table of EIAJ Standard Flat Waveguides and Flanges

| Series description | Frequency range (GHz) | Waveguide standard | | | | Flange standard |
|---|---|---|---|---|---|---|
| | | Type description | Nominal inner size (a × b) mm | Tolerance | | |
| | | | | General class | Precision class | |
| WFI Series | 1.72~2.61 | WFI-22 | 109.22×13.100 | 0.22 | 0.110 | FUGF 22 |
| | 2.17~3.30 | WFI-26 | 86.36×10.400 | 0.17 | 0.086 | FUGF 26 |
| | 2.60~3.95 | WFI-32 | 72.14× 8.600 | 0.14 | 0.072 | FUGF 32 |
| | 3.22~4.90 | WFI-40 | 58.17× 7.000 | 0.12 | 0.058 | FUGF 40 |
| | 3.94~5.99 | WFI-48 | 47.55× 5.700 | 0.095 | 0.048 | FUGF 48 |
| | 4.64~7.05 | WFI-58 | 40.39× 5.000 | 0.081 | 0.040 | FUGF 58 |
| | 5.38~8.17 | WFI-70 | 34.85× 5.000 | 0.070 | 0.035 | FUGF 70 |
| | 6.57~9.99 | WFI-84 | 28.49× 5.000 | 0.057 | 0.028 | FUGF 84 |
| WMI Series | 1.72~2.61 | WMI-22 | 109.22×27.300 | 0.22 | 0.110 | FUGM22 |
| | 2.17~3.30 | WMI-26 | 86.36×21.600 | 0.17 | 0.086 | FUGM26 |
| | 2.60~3.95 | WMI-32 | 72.14×18.000 | 0.14 | 0.072 | FUGM32 |
| | 3.22~4.90 | WMI-40 | 58.17×14.500 | 0.12 | 0.058 | FUGM40 |
| | 3.94~5.99 | WMI-48 | 47.55×11.900 | 0.095 | 0.048 | FUGM48 |
| | 4.64~7.05 | WMI-58 | 40.39×10.100 | 0.081 | 0.040 | FUGM58 |
| | 5.88~8.17 | WMI-70 | 34.85× 8.700 | 0.070 | 0.035 | FUGM70 |
| | 8.20~12.5 | WMI-100 | 22.86× 5.000 | 0.046 | 0.023 | FUGM100 |

Remarks (1) The ratio of longer vs. shorter inner sides of a waveguide is as follows: WF1 Series 8.33:1, and WM1 Series 4:1.

# Table of Rectangular Waveguide Flange Standards

| JIS Standard | | | E I A J Standard | | | | M I L Standard (A N Standard) | | | | | | | | E I A Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non-hermetic sealing | Hermetic sealing | | Rectangular or special | | Round or square | | Non-hermetic sealing | | Hermetic sealing | | | | Choke type | | | | Non-hermetic | Hermetic |
| | | | | | | | | | Copper alloy | | Aluminum alloy | | Copper alloy | | Aluminum alloy | | | |
| | Gasket side | Flat side | Non-hermetic | Hermetic | Non-hermetic | Hermetic | Copper alloy | Aluminum alloy | Gasket side | Flat side | Gasket side | Flat side | Choke side | Flat side | Choke side | Flat side | | |
| | | | | | | | | | | | | | | | | | | CPR2300 |
| | | | | | | | | | | | | | | | | | | CPR2100 |
| | | | | | | | | | | | | | | | | | | CPR1800 |
| | | | | | | | | | | | | | | | | | | CPR1500 |
| | | | | | | | | | | | | | | | | | | CPR1150 |
| | | | | | | | | | | | | | | | | | | CPR975 |
| | | | | | | | | | | | | | | | | | | CPR770 |
| | | | | FPDR14 | | | | | M3922/52－023※4 (UG－1362/U) | M3922/52－001 (UG－1714/U) | M3922/52－024※7 (UG－1343/U) | M3922/52－002 (UG－1720/U) | | | | | | CPR650 |
| | | | | FPDR18 | | | | | M3922/52－025 (UG－1718/U) | M3922/52－003 (UG－1715/U) | M3922/52－026 (UG－1719/U) | M3922/52－004 (UG－1717/U) | | | | | | CPR510 |
| BRJ-2 ※1 | PRJ-2 ※1 | (PRJ-2) ※1 | | FPDR22 | | | | | M3922/52－027※5 (UG－1344/U) | M3922/52－005 (UG－1716/U) | M3922/52－028※8 (UG－1345/U) | M3922/52－006 (UG－1711/U) | | | | | | CPR430 |
| | | | | FPDR26 | | | | | M3922/52－029※6 (UG－1346/U) | M3922/52－007 (UG－1712/U) | M3922/52－030※9 (UG－1347/U) | M3922/52－008 (UG－1713/U) | | | | | | CPR340 |
| BRJ-3 | — | — | FUER32 | FPDR32 | FUAR32 | FPAR32 | M3922/64－001 (UG－1479/U) | M3922/64－002 (UG－1484/U) | M3922/52－031 (UG－1348/U) | M3922/52－009 (UG－1724/U) | M3922/52－032 (UG－1349/U) | M3922/52－010 (UG－1725/U) | M3922/61－002 (UG－54B/U) | M3922/56－001 (UG－53/U) | M3922/61－001 (UG－585A/U) | M3922/56－002 (UG－584/U) | CMR284 | CPR284 |
| BRJ-4 | PRJ-4 ※1 | (PRJ-4) ※1 | FUER40 | FPDR40 | FUAR40 | FPAR40 | | | M3922/52－033 (UG－1350/U) | M3922/52－011 (UG－1726/U) | M3922/52－034 (UG－1351/U) | M3922/52－012 (UG－1727/U) | | | | | CMR229 | CPR229 |
| BRJ-5 | — | — | FUER48 | FPDR48 | FUAR48 | FPAR48 | M3922/63－001 (UG－1475/U) | M3922/63－005 (UG－1480/U) | M3922/52－035 (UG－1352/U) | M3922/52－013 (UG－1728/U) | M3922/52－036 (UG－1353/U) | M3922/52－014 (UG－1729/U) | M3922/62－002 (UG－148C/U) | M3922/57－002 (UG－149A/U) | M3922/62－001 (UG－406B/U) | M3922/57－001 (UG－407/U) | CMR187 | CPR187 |
| BRJ-6 | PRJ-6G ※1 | PRJ-6P ※1 | FUER58 | FPDR58 | FUAR58 | FPAR58 | | | M3922/52－037 (UG－1354/U) | M3922/52－015 (UG－1730/U) | M3922/52－038 (UG－1355/U) | M3922/52－016 (UG－1731/U) | | | | | CMR159 | CPR159 |
| BRJ-7 | PRJ-7 ※1 | (PRJ-7) ※1 | FUER70 | FPDR70 | FUAR70 | FPAR70 | M3922/63－002 (UG－1476/U) | M3922/63－006 (UG－1481/U) | M3922/52－039 (UG－1356/U) | M3922/52－017 (UG－1732/U) | M3922/52－040 (UG－1357/U) | M3922/52－018 (UG－1733/U) | M3922/60－001 (UG－343B/U) | M3922/55－001 (UG－344/U) | M3922/60－002 (UG－440B/U) | M3922/55－002 (UG－441/U) | CMR137 | CPR137 |
| BRJ-9 | — | — | FUER84 | FPDR84 | FUBR84 | FPBR84 | M3922/63－003 (UG－1477/U) | M3922/63－007 (UG－1482/U) | M3922/52－041 (UG－1358/U) | M3922/52－019 (UG－1734/U) | M3922/52－042 (UG－1359/U) | M3922/52－020 (UG－1735/U) | M3922/59－007 (UG－52B/U) | M3922/53－002 (UG－51/U) | M3922/59－009 (UG－137B/U) | M3922/53－004 (UG－138/U) | CMR112 | CPR112 |
| BRJ-10 | PRJ-10G ※1 | PRJ-10P ※1 | FUER100 | FPDR100 | FUBR100 | FPBR100 | M3922/63－004 (UG－1478/U) | M3922/63－008 (UG－1483/U) | M3922/52－043 (UG－1360/U) | M3922/52－021 (UG－1736/U) | M3922/52－044 (UG－1361/U) | M3922/52－022 (UG－1737/U) | M3922/59－006 (UG－40B/U) | M3922/53－001 (UG－39/U) | M3922/59－008 (UG－136B/U) | M3922/53－003 (UG－135/U) | CMR90 | CPR90 |
| BRJ-120 ※1 | — | — | FUDR120 | FPDR120 | FUBR120 | FPBR120 | | | | | | | M3922/59－010 | M3922/53－007 | M3922/59－011 | M3922/53－008 | | |
| BRJ-140 ※1 | | | FUDR140 | FPDR140 | FUBR140 | FPBR140 | | | | | | | M3922/59－001 (UG－541A/U) | M3922/53－005 (UG－419/U) | M3922/59－002 (UG－1666/U) | M3922/53－006 (UG－1665/U) | | |
| BRJ-18 ※2 | | | FUDR180 | FPDR180 | FUBR180 | FPBR180 | | | | | | | M3922/69－004 | M3922/70－010 | M3922/69－005 | M3922/70－011 | | |
| BRJ-24 ※2 | | | | FPCR220 | FUBR220 | FPBR220 | M3922/67－004 | M3922/67－011 | | | | | M3922/59－003 (UG－596A/U) | M3922/54－001 (UG－595/U) | M3922/59－004 (UG－598A/U) | M3922/54－002 (UG－597/U) | | |
| BRJ-27 ※2 | | | | FPCR260 | FUBR260 | FPBR260 | M3922/63－009 (UG－1530/U) | | | | | | | | | | | |
| BRJ-34 ※2 | | | | FPCR320 | FUBR320 | FPBR320 | M3922/67－005 | M3922/67－012 | M3922/68－003 | M3922/68－001 | | | M3922/59－005 (UG－600A/U) | M3922/54－003 (UG－599/U) | | | | |
| BRJ-40 ※2 | | | | FPCR400 | | | M3922/67－006 | M3922/67－013 | | | | | | | | | | |
| BRJ-50 ※2 | | | | FPCR500 | | | M3922/67－007 | | | | | | | | | | | |
| BRJ-60 ※2 | | | | FPFR620 | | | M3922/67－008 | | | | | | | | | | | |
| BRJ-75 ※2 | | | | FPFR740 | | | M3922/67－003 (UG－387/U) | | | | | | | | | | | |
| BRJ-95 ※2 | | | | FPFR900 | | | M3922/67－010 | | | | | | | | | | | |
| SPC-1200 ※3 | | | | FPFR1200 | | | M3922/66－006 (UG－1527/U) | | | | | | | | | | | |
| SPC-1400 ※3 | | | | | | | M3922/66－004 (UG－1525/U) | | | | | | | | | | | |
| SPC-1800 ※3 | | | | | | | M3922/66－003 (UG－1524/U) | | | | | | | | | | | |
| SPC-2200 ※3 | | | | | | | M3922/66－005 (UG－1526/U) | | | | | | | | | | | |
| SPC-2600 ※3 | | | | | | | M3922/66－005 (UG－1526/U) | | | | | | | | | | | |

Remarks (1) Items indicated in colored boxes denote SPC's standard waveguides and flanges.
(2) The flanges marked by ※1 in the column of JIS Standard are of EIAJ Standard (former CES Standard).
(3) The flanges marked by ※2 in the column of JIS Standard are of the Standard of Communications Technical Committee.
(4) The items marked by ※3 in the column of JIS Standard are the standard flanges specified exclusively by SPC. External dimensions, mounting hole locations, etc. of each flange are the same as those of UG-387/U of the MIL Standard.
(5) The type description of flanges in accordance with the IEC Standard is the same as that of the EIAJ Standard, but symbol 'F' deleted from the head. Therefore this type description is omitted here. (Example: FUBR48 → UBR48)
(6) Only typical type descriptions are listed here for the MIL Standard. Even for the same frequencies and shapes, there may be discrepancy in type descriptions if there is partial difference in flange thickness, etc. For more detailed information, refer to MIL-F-3922.
(7) The hermetically sealed items to the MIS Standard in this table are hardly used at present. However, the items marked by *4 ~ *9 are presently manufactured in accordance with the standard given on the right. (This should be specified at time of ordering.)

| Copper alloy | | Aluminum alloy | |
|---|---|---|---|
| ※4 | M3922/58－007 (UG－417B/U) | ※7 | M3922/58－008 (UG－418B/U) |
| ※5 | M3922/58－009 (UG－435B/U) | ※8 | M3922/58－010 (UG－437B/U) |
| ※6 | M3922/58－011 (UG－553A/U) | ※9 | M3922/58－012 (UG－554A/U) |

## Names of Standard and Abbreviations

| Abbreviation of standard | Formal Standard name |
|---|---|
| J I S | Japanese Industrial Standards |
| E I A J (Former CES) | Standards of Electronic Industries Association of Japan |
| I E C | International Electrotechnical Commission |
| E I A (Former RETMA) | Electronic Industries Association USA. |
| M I L | Military Specification and Standards |
| A N | Air Force-Navy Aeronautical Standard USA. |

# Table of Rectangular Waveguide Flange Dimensions

| Model | A | B | C | D | E | F | Figure (Example) |
|---|---|---|---|---|---|---|---|
| BRJ-2 | 71 | 43.69 | 161 | 106.5 | 45.39 | 23.83 | Fig.1 |

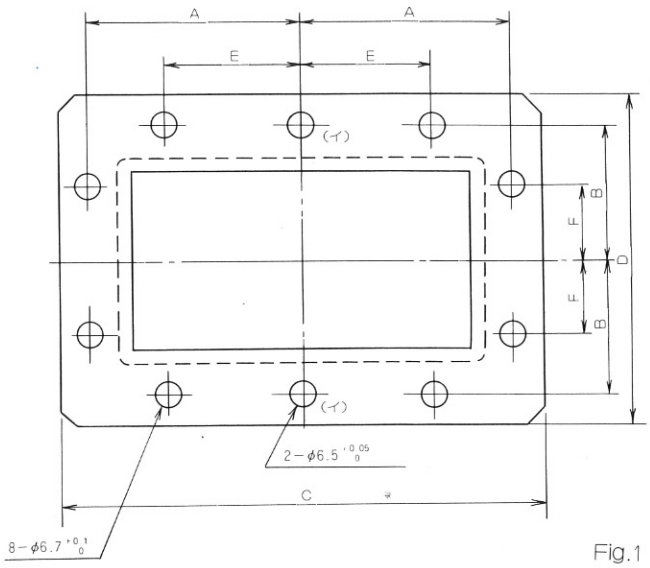


Fig.1

| Model | C | D | G | H | I | Figure (Example) |
|---|---|---|---|---|---|---|
| BRJ-3 | 100 | 60 | 88 | 50 | 30 | Fig.2 |
| BRJ-4 | 90 | 60 | 76 | 47 | 20 | Fig.2 |

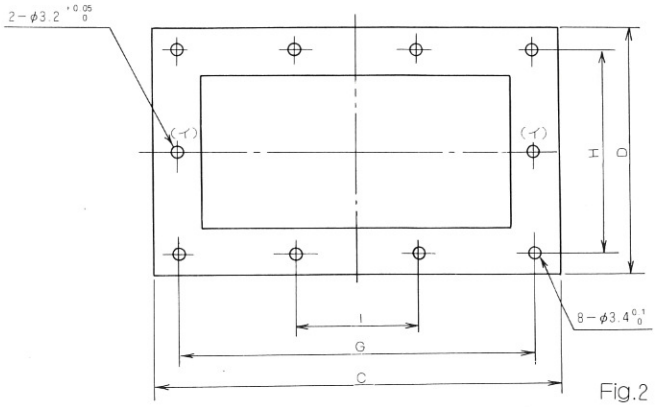


Fig.2

| Model | C | D | G | H | I | Figure (Example) |
|---|---|---|---|---|---|---|
| BRJ-4 (thin) | 90 | 40 | 76 | 28 | 20 | Fig.3 |

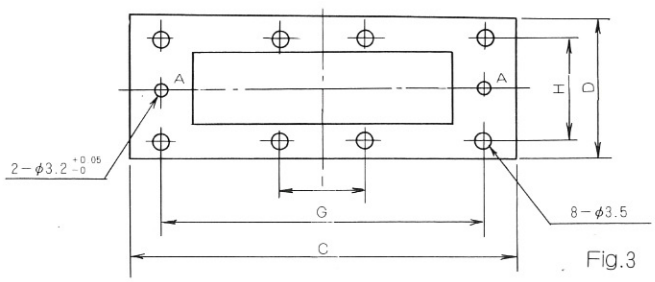


Fig.3

6

# Table of Rectangular Waveguide Flange Dimensions

| Model | A | B | C | D | J | K | Figure (Example) |
|---|---|---|---|---|---|---|---|
| FUGM48 | ±0.025 30.86 | ±0.025 15 | 70.5 | 40 | ±0.025 10.29 | ±0.025 11.89 | Fig.4 |

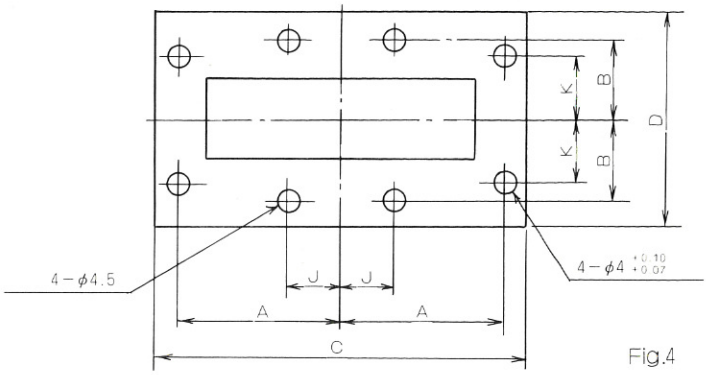


Fig.4

| Model | C | D | G | H | J | Figure (Example) |
|---|---|---|---|---|---|---|
| BRJ-5 | 74 | 50 | 58 | 40 | 66 | Fig.5 |
| BRJ-6 | 70 | 50 | 52 | 38 | 58 | Fig.5 |
| BRJ-7 | 70 | 50 | 50 | 36 | 56 | Fig.5 |

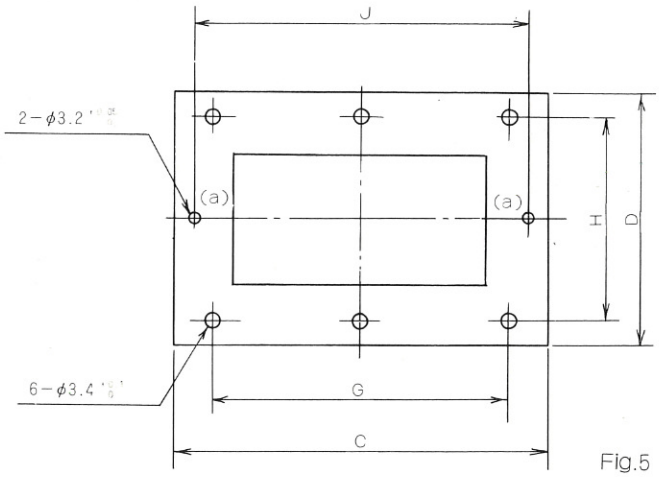


Fig.5

| Model | C | D | G | H | Figure (Example) |
|---|---|---|---|---|---|
| BRJ-9 | 48 | 48 | 34.4 | 37.4 | Fig.6 |
| BRJ 10 | 42 | 42 | 31 | 32.5 | Fig.6 |

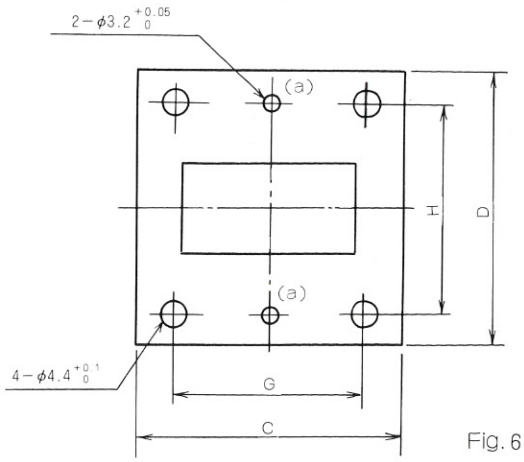


Fig. 6

# Table of Rectangular Waveguide Flange Dimensions

| Model | A | B | C | D | d | Figure (Example) |
|---|---|---|---|---|---|---|
| BRJ-120 | 13.21 ±0.025 | 14.25 ±0.025 | 38 | 38 | $4^{+0.12}_{+0.07}$ | Fig.7 |
| BRJ-140 | 12.625 ±0.025 | 12.14 ±0.025 | 33.5 | 33.5 | $4^{+0.12}_{+0.07}$ | Fig.7 |
| FUBR180 | 10.285 ±0.025 | 11.25 ±0.025 | 30.5 | 30.5 | $4^{+0.10}_{+0.07}$ | Fig.7 |
| FUBR220 | 8.13 ±0.02 | 8.51 ±0.02 | 22.4 | 22.4 | $3^{+0.085}_{+0.060}$ | Fig.7 |
| FUBR260 | 7.495 ±0.02 | 7.875 ±0.02 | 21.5 | 21.5 | $3^{+0.085}_{+0.060}$ | Fig.7 |
| FUBR320 | 6.35 ±0.02 | 6.73 ±0.02 | 19.1 | 19.1 | $3^{+0.085}_{+0.060}$ | Fig.7 |

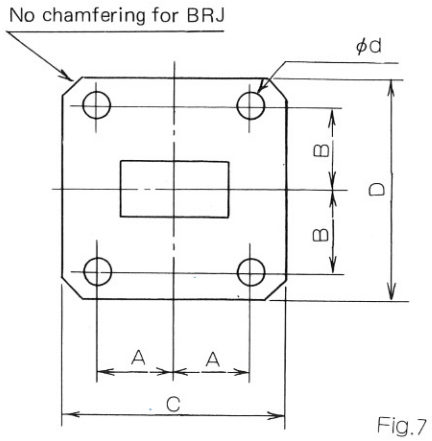


Fig.7

| Model | A | B | C | D | E | d | Figure (Example) |
|---|---|---|---|---|---|---|---|
| BRJ-40 | 10.5 | 15.5 | 20±0.04 | 24.5 | 28 | $2.6^{+0.06}_{+0.02}$ | Fig.8 |
| BRJ-50 | 10.5 | 15.5 | 20±0.04 | 24.5 | 28 | $2.6^{+0.06}_{+0.02}$ | Fig.8 |
| BRJ-60 | 10.5 | 15.5 | 20±0.02 | 24.5 | 28 | $2.6^{+0.014}_{0}$ | Fig.8 |
| BRJ-75 | 10.5 | 15.5 | 20±0.02 | 24.5 | 28 | $2.6^{+0.014}_{0}$ | Fig.8 |
| BRJ-95 | 10.5 | 15.5 | 20±0.02 | 24.5 | 28 | $2.6^{+0.014}_{0}$ | Fig.8 |

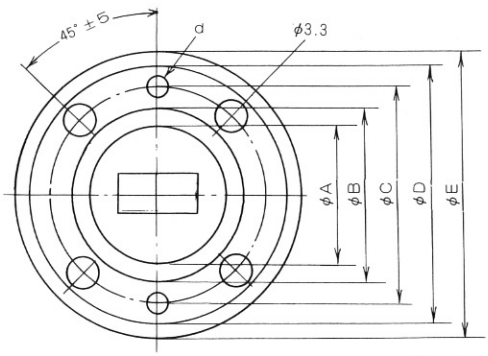


Fig.8

| Model | A | B | Figure (Example) |
|---|---|---|---|
| SPC-1200 | 14.29 | 19 | Fig.9 |
| SPC-1400 | | | |
| SPC-1800 | | | |
| SPC-2200 | | | |
| SPC-2600 | | | |

Note: UG-387/U (MIL Standard): Compatible with flange.

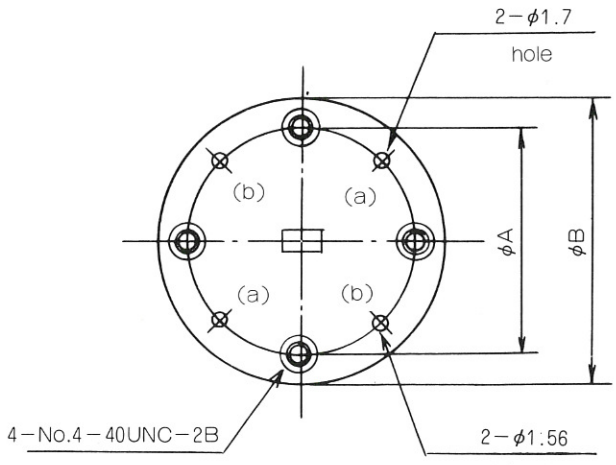


Fig.9

# VSWR Conversion Table

① Reflection coefficient $=\frac{VSWR-1}{VSWR+1}$ ② Reflection loss(dB)$=20\log(\frac{1}{\Gamma})$ ③ Reflection power(%)$=\Gamma^2\times 100$

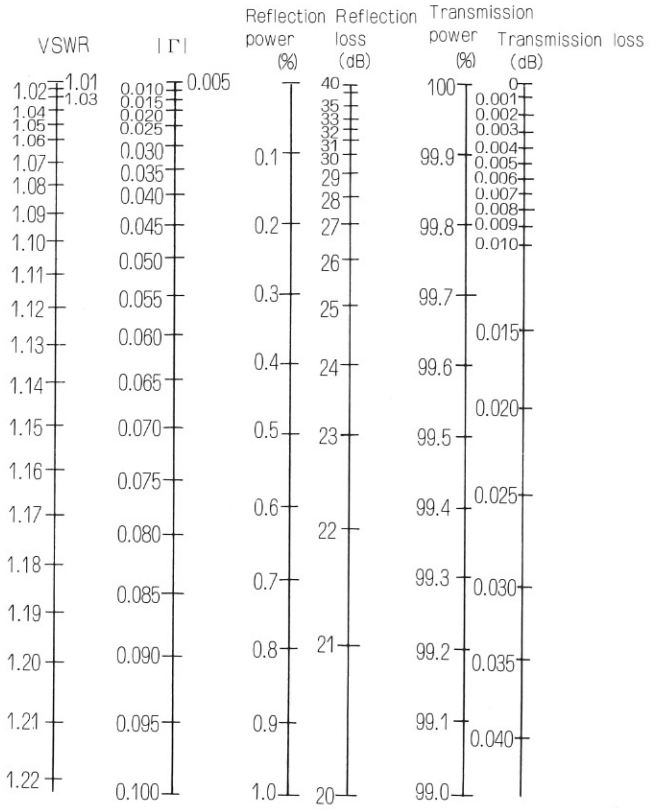
④ Transmission power(%)$=(1-\Gamma^2)\times 100$ ⑤ Transmission loss(dB)$=-10\log(1-\Gamma^2)$

| VSWR | Reflection coefficient \| Γ \| | Reflection loss (dB) | Reflection power (%) | Transmission power (%) | Transmission loss (dB) |
|---|---|---|---|---|---|
| 1.00 | 0.0000 | ∞ | 0.000 | 100.000 | 0.000 |
| 1.05 | .0244 | 32.25 | 0.060 | 99.940 | .003 |
| 1.10 | .0476 | 26.45 | 0.227 | 99.773 | .010 |
| 1.15 | .0698 | 23.12 | 0.487 | 99.513 | .021 |
| 1.20 | .0909 | 20.83 | 0.826 | 99.174 | .036 |
| 1.25 | .1111 | 19.09 | 1.234 | 98.766 | .054 |
| 1.30 | .1304 | 17.70 | 1.700 | 98.300 | .074 |
| 1.35 | .1489 | 16.54 | 2.217 | 97.783 | .097 |
| 1.40 | .1667 | 15.56 | 2.779 | 97.221 | .122 |
| 1.45 | .1837 | 14.72 | 3.375 | 96.625 | .149 |
| 1.50 | .2000 | 13.98 | 4.000 | 96.000 | .177 |
| 1.55 | .2157 | 13.32 | 4.653 | 95.347 | .207 |
| 1.60 | .2308 | 12.74 | 5.327 | 94.673 | .238 |
| 1.65 | .2453 | 12.21 | 6.017 | 93.983 | .269 |
| 1.70 | .2593 | 11.73 | 6.724 | 93.276 | .302 |
| 1.75 | .2727 | 11.29 | 7.437 | 92.563 | .336 |
| 1.80 | .2857 | 10.88 | 8.162 | 91.838 | .370 |
| 1.85 | .2982 | 10.51 | 8.892 | 91.108 | .404 |
| 1.90 | .3103 | 10.16 | 9.629 | 90.371 | .440 |
| 1.95 | .3220 | 9.84 | 10.37 | 89.63 | .475 |
| 2.00 | .3333 | 9.54 | 11.11 | 88.89 | .511 |
| 2.05 | .3443 | 9.26 | 11.85 | 88.15 | .548 |
| 2.10 | .3548 | 8.98 | 12.66 | 87.34 | .584 |
| 2.15 | .3651 | 8.75 | 13.33 | 86.67 | .621 |
| 2.20 | .3750 | 8.52 | 14.06 | 85.94 | .658 |
| 2.25 | .3846 | 8.30 | 14.19 | 85.21 | .695 |
| 2.30 | .3936 | 8.09 | 15.52 | 84.48 | .732 |
| 2.35 | .4030 | 7.89 | 16.24 | 83.76 | .770 |
| 2.40 | .4118 | 7.71 | 16.96 | 83.04 | .807 |
| 2.45 | .4203 | 7.53 | 17.67 | 82.33 | .844 |
| 2.50 | .4386 | 7.36 | 18.37 | 81.63 | .882 |

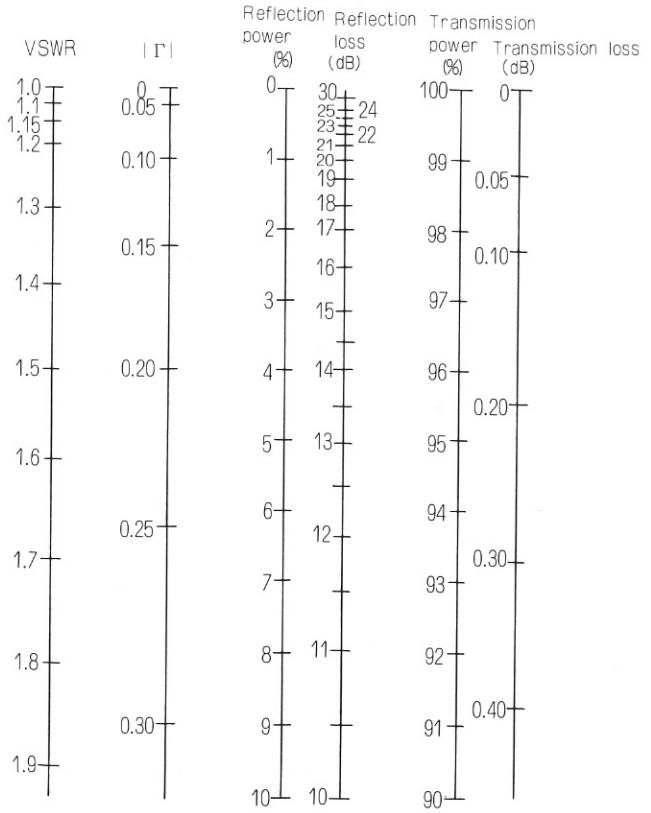
| VSWR | Reflection coefficient \| Γ \| | Reflection loss (dB) | Reflection power (%) | Transmission power (%) | Transmission loss (dB) |
|---|---|---|---|---|---|
| 2.55 | 0.4366 | 7.20 | 19.06 | 80.94 | 0.918 |
| 2.60 | .4444 | 7.04 | 19.75 | 80.25 | .956 |
| 2.65 | .4521 | 6.90 | 20.44 | 79.56 | .993 |
| 2.70 | .4595 | 6.76 | 21.11 | 78.89 | 1.030 |
| 2.75 | .4667 | 6.62 | 21.78 | 78.22 | 1.067 |
| 2.80 | .4737 | 6.49 | 22.44 | 77.56 | 1.104 |
| 2.85 | .4805 | 6.37 | 23.09 | 76.91 | 1.140 |
| 2.90 | .4872 | 6.25 | 23.74 | 76.26 | 1.177 |
| 2.95 | .4937 | 6.13 | 24.37 | 75.63 | 1.213 |
| 3.00 | .5000 | 6.02 | 25.00 | 75.00 | 1.250 |
| 3.05 | .5062 | 5.91 | 25.62 | 74.38 | 1.285 |
| 3.10 | .5122 | 5.81 | 26.23 | 73.77 | 1.321 |
| 3.15 | .5181 | 5.71 | 26.84 | 73.16 | 1.357 |
| 3.20 | .5238 | 5.62 | 27.44 | 72.56 | 1.393 |
| 3.25 | .5294 | 5.52 | 28.03 | 71.97 | 1.429 |
| 3.30 | .5349 | 5.43 | 28.61 | 71.39 | 1.464 |
| 3.35 | .5402 | 5.35 | 29.18 | 70.82 | 1.498 |
| 3.40 | .5455 | 5.26 | 29.76 | 70.24 | 1.534 |
| 3.45 | .5506 | 5.18 | 30.32 | 69.68 | 1.569 |
| 3.50 | .5556 | 5.10 | 30.87 | 69.13 | 1.603 |
| 3.55 | .5604 | 5.03 | 31.40 | 68.60 | 1.637 |
| 3.60 | .5652 | 4.96 | 31.95 | 68.05 | 1.672 |
| 3.65 | .5699 | 4.88 | 32.48 | 67.52 | 1.706 |
| 3.70 | .5745 | 4.81 | 33.01 | 66.99 | 1.740 |
| 3.75 | .5789 | 4.75 | 33.51 | 66.49 | 1.772 |
| 3.80 | .5833 | 4.68 | 34.03 | 65.97 | 1.807 |
| 3.85 | .5876 | 4.62 | 34.53 | 65.47 | 1.840 |
| 3.90 | .5918 | 4.56 | 35.02 | 64.98 | 1.872 |
| 3.95 | .5960 | 4.50 | 35.52 | 64.48 | 1.906 |
| 4.00 | .6000 | 4.44 | 36.00 | 64.00 | 1.938 |
| | | | | | |

# VSWR Nomograms · Improvement of VSWR with use of Attenuators

## 1. VSWR Nomograms

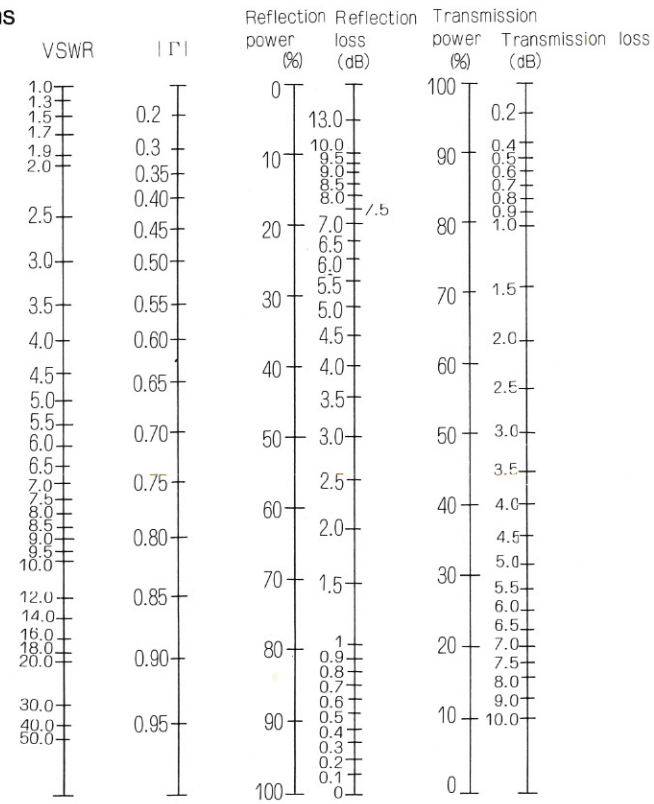



## 2. VSWR Nomograms

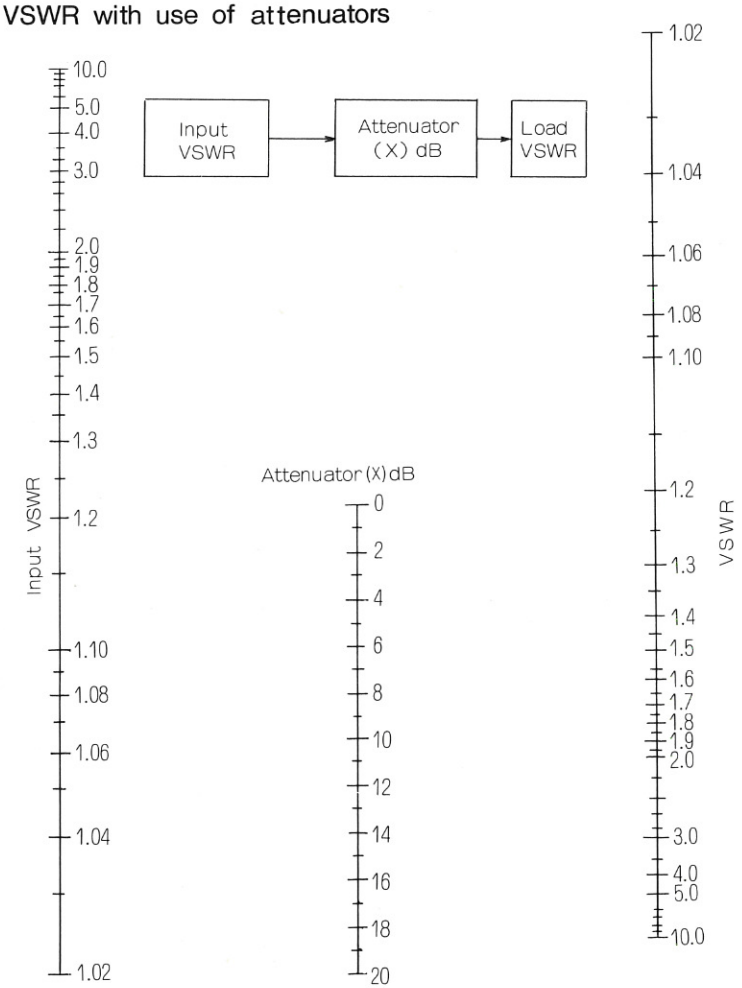


# VSWR Nomograms · Improvement of VSWR with use of Attenuators

## 3. VSWR Nomograms

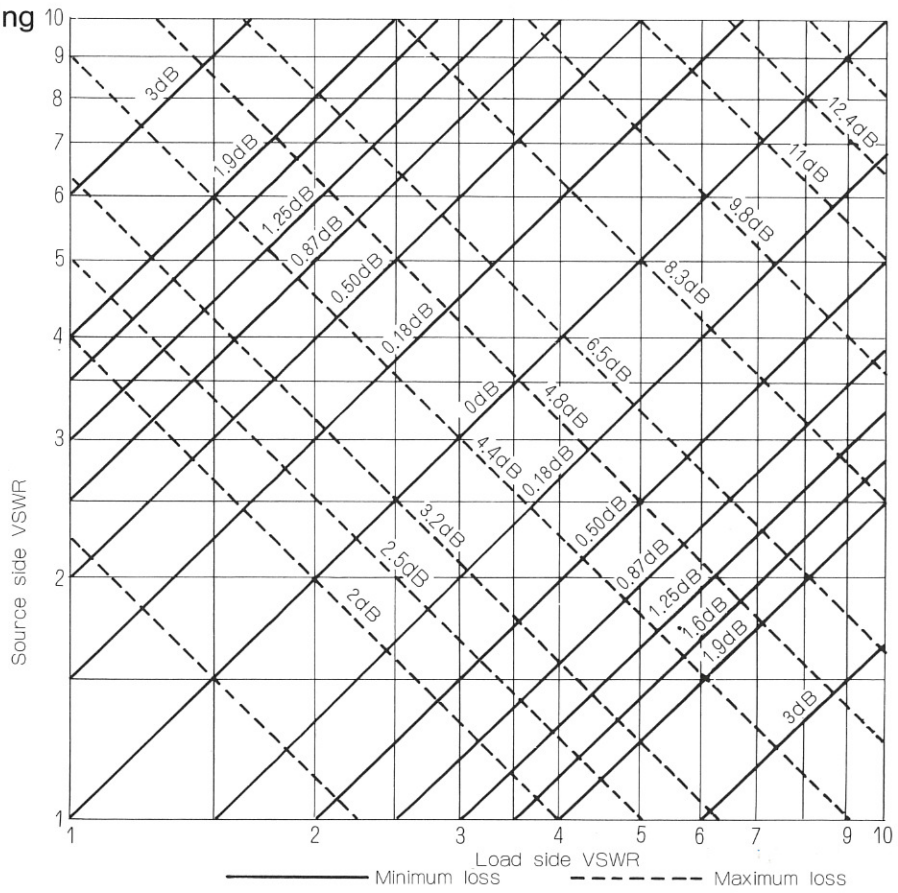



Improvement of VSWR with use of attenuators

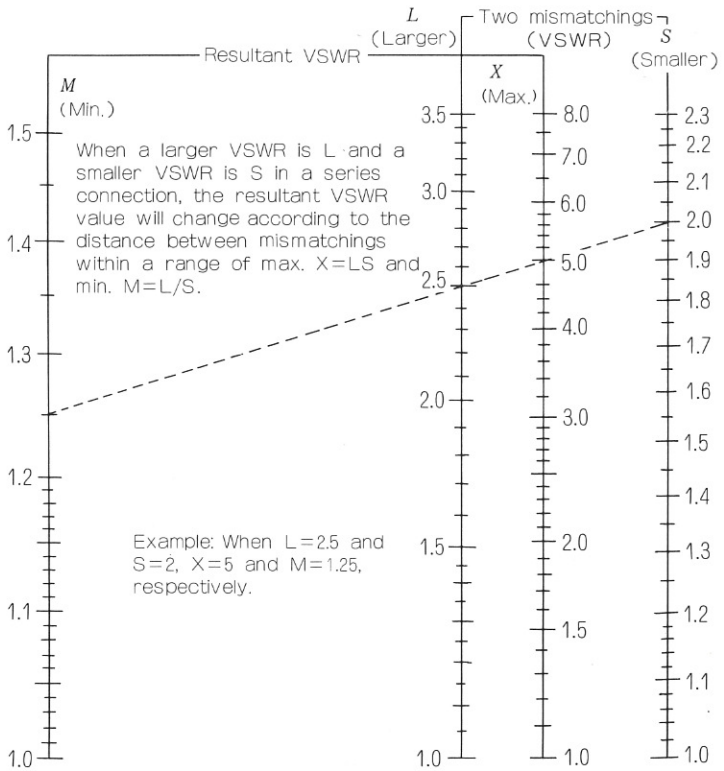


# Max. and Min. VSWR Values Produced by Loss due to Mismatching or by Two Mismatchings

Loss by mismatching




Max. and Min. VSWR Values Caused by Two Mismatchings



# Relation Table for Waveguides and Wave Lengths

**WRJ-2～WRJ-9:**
The wave length ($\lambda g$) of a waveguide can be obtained from the following expression:

$$\lambda g = \frac{\lambda}{\sqrt{1-\left(\frac{\lambda}{\lambda c}\right)^2}}$$

Where, $\lambda$ = wave length in free space
$\lambda = c/f$
c = velocity of light
$= 2.997925 \times 10^{10}$ cm/sec
f = frequency
$\lambda c = 2a$ = wave length of cut-off frequency
a = wider-side dimension of a rectangular waveguide

## ● WRJ-10

Inner dimensions of waveguide
22.9×10.2(mm)
Cut-off wave length
=2a=4.572cm
Cut-off frequency
6557.14MHz
Frequency range
8.2～12.4GHz

| f (GHz) | λ (cm) | λg (cm) |
|---|---|---|
| 8.200 | 3.6560 | 6.0886 |
| 8.300 | 3.6120 | 5.8914 |
| 8.400 | 3.5690 | 5.7102 |
| 8.500 | 3.5270 | 5.5428 |
| 8.600 | 3.4860 | 5.3876 |
| 8.700 | 3.4459 | 5.2431 |
| 8.800 | 3.4067 | 5.1082 |
| 8.900 | 3.3685 | 4.9818 |
| 9.000 | 3.3310 | 4.8630 |
| 9.100 | 3.2944 | 4.7512 |
| 9.200 | 3.2586 | 4.6456 |
| 9.300 | 3.2236 | 4.5458 |
| 9.400 | 3.1893 | 4.4511 |
| 9.500 | 3.1557 | 4.3612 |
| 9.600 | 3.1228 | 4.2756 |
| 9.700 | 3.0906 | 4.1941 |
| 9.800 | 3.0591 | 4.1163 |
| 9.900 | 3.0282 | 4.0419 |
| 10.000 | 2.9979 | 3.9707 |
| 10.100 | 2.9682 | 3.9025 |
| 10.200 | 2.9391 | 3.8371 |
| 10.300 | 2.9106 | 3.7742 |
| 10.400 | 2.8826 | 3.7138 |
| 10.500 | 2.8552 | 3.6556 |
| 10.600 | 2.8282 | 3.5996 |
| 10.700 | 2.8018 | 3.5456 |
| 10.800 | 2.7759 | 3.4934 |
| 10.900 | 2.7504 | 3.4431 |
| 11.000 | 2.7254 | 3.3944 |
| 11.100 | 2.7008 | 3.3473 |
| 11.200 | 2.6767 | 3.3017 |
| 11.300 | 2.6530 | 3.2576 |
| 11.400 | 2.6298 | 3.2148 |
| 11.500 | 2.6069 | 3.1733 |
| 11.600 | 2.5844 | 3.1330 |
| 11.700 | 2.5623 | 3.0939 |
| 11.800 | 2.5406 | 3.0559 |
| 11.900 | 2.5193 | 3.0189 |
| 12.000 | 2.4983 | 2.9830 |
| 12.100 | 2.4776 | 2.9480 |
| 12.200 | 2.4573 | 2.9140 |
| 12.300 | 2.4373 | 2.8808 |
| 12.400 | 2.4177 | 2.8485 |

## ● WRI-120

IEC : R-120
EIA : WR-75
Inner dimensions of waveguide
19.050×9.525(mm)
Cut-off wave length
=2a=3.810cm
Cut-off frequency
7868.6MHz
Frequency range
9.84～15.0GHz

| f (GHz) | λ (cm) | λg (cm) |
|---|---|---|
| 9.000 | 3.3310 | 6.8623 |
| 9.100 | 3.2944 | 6.5583 |
| 9.200 | 3.2586 | 6.2887 |
| 9.300 | 3.2236 | 6.0474 |
| 9.400 | 3.1893 | 5.8297 |
| 9.500 | 3.1557 | 5.6319 |
| 9.600 | 3.1228 | 5.4512 |
| 9.700 | 3.0906 | 5.2852 |
| 9.800 | 3.0591 | 5.1319 |
| 9.900 | 3.0282 | 4.9899 |
| 10.000 | 2.9979 | 4.8578 |
| 10.100 | 2.9682 | 4.7345 |
| 10.200 | 2.9391 | 4.6190 |
| 10.300 | 2.9106 | 4.5105 |
| 10.400 | 2.8826 | 4.4084 |
| 10.500 | 2.8552 | 4.3121 |
| 10.600 | 2.8282 | 4.2209 |
| 10.700 | 2.8018 | 4.1346 |
| 10.800 | 2.7759 | 4.0525 |
| 10.900 | 2.7504 | 3.9745 |
| 11.000 | 2.7254 | 3.9001 |
| 11.100 | 2.7008 | 3.8292 |
| 11.200 | 2.6767 | 3.7614 |
| 11.300 | 2.6530 | 3.6965 |
| 11.400 | 2.6298 | 3.6343 |
| 11.500 | 2.6069 | 3.5746 |
| 11.600 | 2.5844 | 3.5174 |
| 11.700 | 2.5623 | 3.4623 |
| 11.800 | 2.5406 | 3.4093 |
| 11.900 | 2.5193 | 3.3582 |
| 12.000 | 2.4983 | 3.3089 |
| 12.100 | 2.4776 | 3.2614 |
| 12.200 | 2.4573 | 3.2155 |
| 12.300 | 2.4373 | 3.1711 |
| 12.400 | 2.4177 | 3.1282 |
| 12.500 | 2.3983 | 3.0866 |
| 12.600 | 2.3793 | 3.0464 |
| 12.700 | 2.3606 | 3.0073 |
| 12.800 | 2.3421 | 2.9695 |
| 12.900 | 2.3240 | 2.9327 |
| 13.000 | 2.3061 | 2.8970 |
| 13.100 | 2.2885 | 2.8624 |
| 13.200 | 2.2712 | 2.8287 |
| 13.300 | 2.2541 | 2.7959 |
| 13.400 | 2.2373 | 2.7640 |
| 13.500 | 2.2207 | 2.7329 |
| 13.600 | 2.2044 | 2.7026 |
| 13.700 | 2.1883 | 2.6731 |
| 13.800 | 2.1724 | 2.6444 |
| 13.900 | 2.1568 | 2.6163 |
| 14.000 | 2.1414 | 2.5890 |
| 14.100 | 2.1262 | 2.5623 |
| 14.200 | 2.1112 | 2.5362 |
| 14.300 | 2.0965 | 2.5107 |
| 14.400 | 2.0819 | 2.4858 |
| 14.500 | 2.0675 | 2.4615 |
| 14.600 | 2.0534 | 2.4377 |
| 14.700 | 2.0394 | 2.4144 |
| 14.800 | 2.0256 | 2.3916 |
| 14.900 | 2.0120 | 2.3694 |
| 15.000 | 1.9986 | 2.3475 |

## ● WRJ-140

JAN : RG-91/U
EIA : WR-62
Inner dimensions of waveguide
15.799×7.899(mm)
Cut-off wave length
=2a=3.160cm
Cut-off frequency
9487.7MHz
Frequency range
11.9～18.0GHz

| f (GHz) | λ (cm) | λg (cm) |
|---|---|---|
| 11.000 | 2.7254 | 5.3849 |
| 11.100 | 2.7008 | 5.2026 |
| 11.200 | 2.6767 | 5.0362 |
| 11.300 | 2.6530 | 4.8836 |
| 11.400 | 2.6298 | 4.7428 |
| 11.500 | 2.6069 | 4.6125 |
| 11.600 | 2.5844 | 4.4913 |
| 11.700 | 2.5623 | 4.3783 |
| 11.800 | 2.5406 | 4.2725 |
| 11.900 | 2.5193 | 4.1733 |
| 12.000 | 2.4983 | 4.0799 |
| 12.100 | 2.4776 | 3.9917 |
| 12.200 | 2.4573 | 3.9084 |
| 12.300 | 2.4373 | 3.8295 |
| 12.400 | 2.4177 | 3.7546 |
| 12.500 | 2.3983 | 3.6834 |
| 12.600 | 2.3793 | 3.6155 |
| 12.700 | 2.3606 | 3.5508 |
| 12.800 | 2.3421 | 3.4889 |
| 12.900 | 2.3240 | 3.4297 |
| 13.000 | 2.3061 | 3.3730 |
| 13.100 | 2.2885 | 3.3187 |
| 13.200 | 2.2712 | 3.2664 |
| 13.300 | 2.2541 | 3.2162 |
| 13.400 | 2.2373 | 3.1679 |
| 13.500 | 2.2207 | 3.1214 |
| 13.600 | 2.2044 | 3.0765 |
| 13.700 | 2.1883 | 3.0332 |
| 13.800 | 2.1724 | 2.9914 |
| 13.900 | 2.1568 | 2.9510 |
| 13.000 | 2.1414 | 2.9119 |
| 13.100 | 2.1262 | 2.8741 |
| 13.200 | 2.1112 | 2.8374 |
| 14.300 | 2.0965 | 2.8019 |
| 14.400 | 2.0819 | 2.7674 |
| 14.500 | 2.0675 | 2.7339 |
| 14.600 | 2.0534 | 2.7014 |
| 14.700 | 2.0394 | 2.6699 |
| 14.800 | 2.0256 | 2.6392 |
| 14.900 | 2.0120 | 2.6093 |
| 15.000 | 1.9986 | 2.5803 |
| 15.100 | 1.9854 | 2.5520 |
| 15.200 | 1.9723 | 2.5244 |
| 15.300 | 1.9594 | 2.4975 |
| 15.400 | 1.9467 | 2.4713 |
| 15.500 | 1.9341 | 2.4458 |
| 15.600 | 1.9217 | 2.4209 |
| 15.700 | 1.9095 | 2.3965 |
| 15.800 | 1.8974 | 2.3728 |
| 15.900 | 1.8855 | 2.3496 |
| 16.000 | 1.8737 | 2.3269 |
| 16.100 | 1.8621 | 2.3047 |
| 16.200 | 1.8506 | 2.2830 |
| 16.300 | 1.8392 | 2.2618 |
| 16.400 | 1.8280 | 2.2410 |
| 16.500 | 1.8169 | 2.2207 |
| 16.600 | 1.8060 | 2.2008 |
| 16.700 | 1.7952 | 2.1813 |
| 16.800 | 1.7845 | 2.1622 |
| 16.900 | 1.7739 | 2.1435 |
| 17.000 | 1.7635 | 2.1252 |
| 17.100 | 1.7532 | 2.1072 |
| 17.200 | 1.7430 | 2.0896 |
| 17.300 | 1.7329 | 2.0723 |
| 17.400 | 1.7229 | 2.0553 |
| 17.500 | 1.7131 | 2.0387 |
| 17.600 | 1.7034 | 2.0223 |
| 17.700 | 1.6937 | 2.0063 |
| 17.800 | 1.6842 | 1.9905 |
| 17.900 | 1.6748 | 1.9750 |
| 18.000 | 1.6655 | 1.9598 |

## ● WRJ-180

IEC : R-180
EIA : WR-51
Inner dimensions of waveguide
12.954×6.477(mm)
Cut-off wave length
=2a=2.591cm
Cut-off frequency
11.5714GHz
Frequency range
14.5～22.0GHz

| f (GHz) | λ (cm) | λg (cm) |
|---|---|---|
| 13.500 | 2.2207 | 4.3113 |
| 13.600 | 2.2044 | 4.1954 |
| 13.700 | 2.1883 | 4.0875 |
| 13.800 | 2.1724 | 3.9869 |
| 13.900 | 2.1568 | 3.8927 |
| 14.000 | 2.1414 | 3.8042 |
| 14.100 | 2.1262 | 3.7210 |
| 14.200 | 2.1112 | 3.6424 |
| 14.300 | 2.0965 | 3.5681 |
| 14.400 | 2.0819 | 3.4978 |

# Relation Table for Waveguides and Wave Lengths

| | | |
|---|---|---|
| 14.500 | 2.0675 | 3.4309 |
| 14.600 | 2.0534 | 3.3673 |
| 14.700 | 2.0394 | 3.3068 |
| 14.800 | 2.0256 | 3.2490 |
| 14.900 | 2.0120 | 3.1938 |
| 15.000 | 1.9986 | 3.1409 |
| 15.100 | 1.9854 | 3.0903 |
| 15.200 | 1.9723 | 3.0417 |
| 15.300 | 1.9594 | 2.9950 |
| 15.400 | 1.9467 | 2.9502 |
| 15.500 | 1.9341 | 2.9070 |
| 15.600 | 1.9217 | 2.8654 |
| 15.700 | 1.9095 | 2.8253 |
| 15.800 | 1.8974 | 2.7866 |
| 15.900 | 1.8855 | 2.7492 |
| 16.000 | 1.8737 | 2.7131 |
| 16.100 | 1.8621 | 2.6781 |
| 16.200 | 1.8506 | 2.6442 |
| 16.300 | 1.8392 | 2.6114 |
| 16.400 | 1.8280 | 2.5796 |
| 16.500 | 1.8169 | 2.5488 |
| 16.600 | 1.8060 | 2.5188 |
| 16.700 | 1.7952 | 2.4897 |
| 16.800 | 1.7845 | 2.4614 |
| 16.900 | 1.7739 | 2.4339 |
| 17.000 | 1.7635 | 2.4072 |
| 17.100 | 1.7532 | 2.3812 |
| 17.200 | 1.7430 | 2.3558 |
| 17.300 | 1.7329 | 2.3311 |
| 17.400 | 1.7229 | 2.3070 |
| 17.500 | 1.7131 | 2.2836 |
| 17.600 | 1.7034 | 2.2607 |
| 17.700 | 1.6937 | 2.2383 |
| 17.800 | 1.6842 | 2.2165 |
| 17.900 | 1.6748 | 2.1952 |
| 18.000 | 1.6655 | 2.1743 |
| 18.100 | 1.6563 | 2.1540 |
| 18.200 | 1.6472 | 2.1341 |
| 18.300 | 1.6382 | 2.1146 |
| 18.400 | 1.6293 | 2.0956 |
| 18.500 | 1.6205 | 2.0769 |
| 18.600 | 1.6118 | 2.0587 |
| 18.700 | 1.6032 | 2.0408 |
| 18.800 | 1.5946 | 2.0233 |
| 18.900 | 1.5862 | 2.0062 |
| 19.000 | 1.5779 | 1.9893 |
| 19.100 | 1.5696 | 1.9729 |
| 19.200 | 1.5614 | 1.9567 |
| 19.300 | 1.5533 | 1.9409 |
| 19.400 | 1.5453 | 1.9253 |
| 19.500 | 1.5374 | 1.9100 |
| 19.600 | 1.5296 | 1.8951 |
| 19.700 | 1.5218 | 1.8804 |
| 19.800 | 1.5141 | 1.8659 |
| 19.900 | 1.5065 | 1.8517 |
| 20.000 | 1.4990 | 1.8378 |
| 20.100 | 1.4915 | 1.8241 |
| 20.200 | 1.4841 | 1.8106 |
| 20.300 | 1.4768 | 1.7974 |
| 20.400 | 1.4696 | 1.7844 |
| 20.500 | 1.4624 | 1.7716 |
| 20.600 | 1.4553 | 1.7590 |
| 20.700 | 1.4483 | 1.7467 |
| 20.800 | 1.4413 | 1.7345 |
| 20.900 | 1.4344 | 1.7225 |
| 21.000 | 1.4276 | 1.7107 |
| 21.100 | 1.4208 | 1.6991 |
| 21.200 | 1.4141 | 1.6877 |
| 21.300 | 1.4075 | 1.6764 |
| 21.400 | 1.4009 | 1.6654 |
| 21.500 | 1.3944 | 1.6544 |
| 21.600 | 1.3879 | 1.6437 |
| 21.700 | 1.3815 | 1.6331 |
| 21.800 | 1.3752 | 1.6227 |
| 21.900 | 1.3689 | 1.6124 |
| 22.000 | 1.3627 | 1.6022 |

## ● WRJ-220

JAN : RG-53/U
EIA : WR-42
Inner dimensions of waveguide
10.668×4.318(mm)
Cut-off wave length
=2a=2.134cm
Cut-off frequency
14.0510GHz
Frequency range
17.6~26.7GHz

| f (GHz) | λ (cm) | λg (cm) |
|---|---|---|
| 16.000 | 1.8737 | 3.9173 |
| 16.100 | 1.8621 | 3.8142 |
| 16.200 | 1.8506 | 3.7182 |
| 16.300 | 1.8392 | 3.6286 |
| 16.400 | 1.8280 | 3.5447 |
| 16.500 | 1.8169 | 3.4659 |
| 16.600 | 1.8060 | 3.3917 |
| 16.700 | 1.7952 | 3.3216 |
| 16.800 | 1.7845 | 3.2554 |
| 16.900 | 1.7739 | 3.1926 |
| 17.000 | 1.7635 | 3.1329 |
| 17.100 | 1.7532 | 3.0761 |
| 18.000 | 1.6655 | 2.6648 |
| 18.200 | 1.6472 | 2.5917 |
| 18.400 | 1.6293 | 2.5236 |
| 18.500 | 1.6205 | 2.4912 |
| 18.600 | 1.6118 | 2.4599 |
| 18.800 | 1.5946 | 2.4002 |
| 19.000 | 1.5779 | 2.3441 |
| 19.200 | 1.5614 | 2.2912 |
| 19.400 | 1.5453 | 2.2412 |
| 19.500 | 1.5374 | 2.2172 |
| 19.600 | 1.5296 | 2.1939 |
| 19.800 | 1.5141 | 2.1490 |
| 20.000 | 1.4990 | 2.1064 |
| 20.200 | 1.4841 | 2.0658 |
| 20.400 | 1.4696 | 2.0271 |
| 20.500 | 1.4624 | 2.0084 |
| 20.600 | 1.4553 | 1.9901 |
| 20.800 | 1.4413 | 1.9548 |
| 21.000 | 1.4276 | 1.9209 |
| 21.200 | 1.4141 | 1.8885 |
| 21.400 | 1.4009 | 1.8573 |
| 21.500 | 1.3944 | 1.8422 |
| 21.600 | 1.3879 | 1.8274 |
| 21.800 | 1.3752 | 1.7987 |
| 22.000 | 1.3627 | 1.7709 |
| 22.200 | 1.3504 | 1.7443 |
| 22.400 | 1.3384 | 1.7185 |
| 22.500 | 1.3324 | 1.7060 |
| 22.600 | 1.3265 | 1.6936 |
| 22.800 | 1.3149 | 1.6696 |
| 23.000 | 1.3034 | 1.6464 |
| 23.200 | 1.2922 | 1.6239 |
| 23.400 | 1.2812 | 1.6022 |
| 23.500 | 1.2757 | 1.5915 |
| 23.600 | 1.2703 | 1.5811 |
| 23.800 | 1.2596 | 1.5606 |
| 24.000 | 1.2491 | 1.5408 |
| 24.200 | 1.2388 | 1.5216 |
| 24.400 | 1.2287 | 1.5029 |
| 24.500 | 1.2236 | 1.4937 |
| 24.600 | 1.2187 | 1.4847 |
| 24.800 | 1.2088 | 1.4670 |
| 25.000 | 1.1992 | 1.4498 |
| 25.200 | 1.1897 | 1.4331 |
| 25.400 | 1.1803 | 1.4168 |
| 25.500 | 1.1757 | 1.4088 |
| 25.600 | 1.1711 | 1.4009 |
| 25.800 | 1.1620 | 1.3855 |
| 26.000 | 1.1530 | 1.3704 |
| 26.200 | 1.1442 | 1.3557 |
| 26.400 | 1.1356 | 1.3413 |
| 26.500 | 1.1313 | 1.3343 |

## ● WRJ-260

IEC : R-260
EIA : WR-34
Inner dimensions of waveguide
8.636×4.318(mm)
Cut-off wave length
=2a=17.272mm
Cut-off frequency
17.3571GHz
Frequency range
21.7~33.0GHz

| f (GHz) | λ (cm) | λg (cm) |
|---|---|---|
| 17.200 | 1.7430 | 3.0221 |
| 17.300 | 1.7329 | 2.9704 |
| 17.400 | 1.7229 | 2.9211 |
| 17.500 | 1.7131 | 2.8739 |
| 17.600 | 1.7034 | 2.8286 |
| 17.700 | 1.6937 | 2.7852 |
| 17.800 | 1.6842 | 2.7435 |
| 17.900 | 1.6748 | 2.7034 |
| 22.000 | 1.3627 | 2.2178 |
| 22.250 | 1.3474 | 2.1535 |
| 22.500 | 1.3324 | 2.0939 |
| 22.750 | 1.3178 | 2.0385 |
| 23.000 | 1.3034 | 1.9866 |
| 23.250 | 1.2894 | 1.9380 |
| 23.500 | 1.2757 | 1.8923 |
| 23.750 | 1.2623 | 1.8493 |
| 24.000 | 1.2491 | 1.8087 |
| 24.250 | 1.2363 | 1.7703 |
| 24.500 | 1.2236 | 1.7338 |
| 24.750 | 1.2113 | 1.6992 |
| 25.000 | 1.1992 | 1.6662 |
| 25.250 | 1.1873 | 1.6348 |
| 25.500 | 1.1757 | 1.6048 |
| 25.750 | 1.1642 | 1.5761 |
| 26.000 | 1.1530 | 1.5487 |
| 26.250 | 1.1421 | 1.5224 |
| 26.500 | 1.1313 | 1.4971 |
| 26.750 | 1.1207 | 1.4729 |
| 27.000 | 1.1103 | 1.4496 |
| 27.250 | 1.1002 | 1.4271 |
| 27.500 | 1.0902 | 1.4055 |
| 27.750 | 1.0803 | 1.3846 |
| 28.000 | 1.0707 | 1.3645 |
| 28.250 | 1.0612 | 1.3450 |
| 28.500 | 1.0519 | 1.3262 |
| 28.750 | 1.0428 | 1.3080 |
| 29.000 | 1.0338 | 1.2904 |
| 29.250 | 1.0249 | 1.2734 |
| 29.500 | 1.0162 | 1.2568 |
| 29.750 | 1.0077 | 1.2408 |
| 30.000 | 0.9993 | 1.2252 |
| 30.250 | 0.9910 | 1.2101 |
| 30.500 | 0.9829 | 1.1954 |
| 30.750 | 0.9749 | 1.1811 |
| 31.000 | 0.9671 | 1.1672 |
| 31.250 | 0.9593 | 1.1537 |
| 31.500 | 0.9517 | 1.1405 |
| 31.750 | 0.9442 | 1.1277 |
| 32.000 | 0.9369 | 1.1151 |
| 32.250 | 0.9296 | 1.1030 |
| 32.500 | 0.9224 | 1.0911 |
| 32.750 | 0.9154 | 1.0795 |
| 33.000 | 0.9085 | 1.0681 |

## ● WRJ-320

JAN : RG-96/U
EIA : WR-28
Inner dimensions of waveguide
7.112×3.556(mm)
Cut-off wave length
=2a=14.224mm
Cut-off frequency
21.0765GHz
Frequency range
26.4~40.0GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 20.000 | 14.990 | 30.171 |
| 20.250 | 14.805 | 28.742 |
| 20.500 | 14.624 | 27.484 |
| 20.750 | 14.448 | 26.365 |
| 21.000 | 14.276 | 25.362 |
| 21.250 | 14.108 | 24.454 |
| 21.500 | 13.944 | 23.628 |
| 21.750 | 13.784 | 22.873 |
| 26.500 | 11.313 | 18.663 |
| 26.750 | 11.207 | 18.200 |
| 27.000 | 11.103 | 17.765 |
| 27.250 | 11.002 | 17.357 |
| 27.500 | 10.902 | 16.972 |
| 27.750 | 10.803 | 16.608 |
| 28.000 | 10.707 | 16.264 |
| 28.250 | 10.612 | 15.937 |
| 28.500 | 10.519 | 15.627 |
| 28.750 | 10.428 | 15.332 |
| 29.000 | 10.338 | 15.050 |
| 29.250 | 10.249 | 14.782 |
| 29.500 | 10.162 | 14.524 |
| 29.750 | 10.077 | 14.278 |
| 30.000 | 9.993 | 14.042 |
| 30.250 | 9.910 | 13.816 |

# Relation Table for Waveguides and Wave Lengths

| | | |
|---|---|---|
| 30.500 | 9.829 | 13.598 |
| 30.750 | 9.749 | 13.389 |
| 31.000 | 9.671 | 13.188 |
| 31.250 | 9.593 | 12.993 |
| 31.500 | 9.517 | 12.806 |
| 31.750 | 9.442 | 12.625 |
| 32.000 | 9.369 | 12.451 |
| 32.250 | 9.296 | 12.282 |
| 32.500 | 9.224 | 12.118 |
| 32.750 | 9.154 | 11.960 |
| 33.000 | 9.085 | 11.806 |
| 33.250 | 9.016 | 11.658 |
| 33.500 | 8.949 | 11.513 |
| 33.750 | 8.883 | 11.373 |
| 34.000 | 8.817 | 11.237 |
| 34.250 | 8.753 | 11.105 |
| 34.500 | 8.690 | 10.976 |
| 34.750 | 8.627 | 10.851 |
| 35.000 | 8.565 | 10.729 |
| 35.250 | 8.505 | 10.610 |
| 35.500 | 8.445 | 10.495 |
| 35.750 | 8.386 | 10.382 |
| 36.000 | 8.328 | 10.272 |
| 36.250 | 8.270 | 10.165 |
| 36.500 | 8.214 | 10.060 |
| 36.750 | 8.158 | 9.958 |
| 37.000 | 8.103 | 9.859 |
| 37.250 | 8.048 | 9.761 |
| 37.500 | 7.995 | 9.666 |
| 37.750 | 7.942 | 9.573 |
| 38.000 | 7.889 | 9.482 |
| 38.250 | 7.838 | 9.392 |
| 38.500 | 7.787 | 9.305 |
| 38.750 | 7.737 | 9.220 |
| 39.000 | 7.687 | 9.136 |
| 39.250 | 7.638 | 9.054 |
| 39.500 | 7.590 | 8.974 |
| 39.750 | 7.542 | 8.896 |
| 40.000 | 7.495 | 8.818 |

## ● WRJ-400

JAN : RG-97/U
EIA : WR-22
Inner dimensions of waveguide
5.690×2.845(mm)
Cut-off wave length
=2a=11.380mm
Cut-off frequency
26.3438GHz
Frequency range
32.9~50.0GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 24.000 | 12.491 | 26.115 |
| 24.250 | 12.363 | 24.996 |
| 24.500 | 12.236 | 24.000 |
| 24.750 | 12.113 | 23.106 |
| 25.000 | 11.992 | 22.297 |
| 25.250 | 11.873 | 21.560 |
| 25.500 | 11.757 | 20.886 |
| 25.750 | 11.642 | 20.265 |
| 26.000 | 11.530 | 19.692 |
| 26.250 | 11.421 | 19.159 |
| 33.000 | 9.0846 | 15.0841 |
| 33.500 | 8.9490 | 14.4867 |
| 34.000 | 8.8174 | 13.9475 |
| 34.500 | 8.6896 | 13.4576 |
| 35.000 | 8.5655 | 13.0098 |
| 35.500 | 8.4449 | 12.5984 |
| 36.000 | 8.3276 | 12.2186 |
| 36.500 | 8.2135 | 11.8665 |
| 37.000 | 8.1025 | 11.5390 |
| 37.500 | 7.9945 | 11.2332 |
| 38.000 | 7.8893 | 10.9468 |
| 38.500 | 7.7868 | 10.6779 |
| 39.000 | 7.6870 | 10.4248 |
| 39.500 | 7.5897 | 10.1859 |
| 40.000 | 7.4948 | 9.9599 |
| 40.500 | 7.4023 | 9.7458 |
| 41.000 | 7.3120 | 9.5425 |
| 41.500 | 7.2239 | 9.3491 |
| 42.000 | 7.1379 | 9.1649 |
| 42.500 | 7.0539 | 8.9892 |
| 43.000 | 6.9719 | 8.8212 |
| 43.500 | 6.8918 | 8.6606 |
| 44.000 | 6.8135 | 8.5067 |
| 44.500 | 6.7369 | 8.3591 |
| 45.000 | 6.6622 | 8.2173 |
| 45.500 | 6.5888 | 8.0811 |
| 46.000 | 6.5172 | 7.9501 |
| 46.500 | 6.4472 | 7.8238 |
| 47.000 | 6.3786 | 7.7022 |
| 47.500 | 6.3114 | 7.5848 |
| 48.000 | 6.2457 | 7.4715 |
| 48.500 | 6.1813 | 7.3620 |
| 49.000 | 6.1182 | 7.2561 |
| 49.500 | 6.0564 | 7.1536 |
| 50.000 | 5.9959 | 7.0544 |

## ● WRJ-500

IEA : R-500
EIA : WR-19
Inner dimensions of waveguide
4.775×2.388(mm)
Cut-off wave length
=2a=9.550mm
Cut-off frequency
31.3919GHz
Frequency range
39.2~59.6GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 40.000 | 7.4948 | 12.0932 |
| 40.500 | 7.4023 | 11.7157 |
| 41.000 | 7.3120 | 11.3673 |
| 41.500 | 7.2239 | 11.0445 |
| 42.000 | 7.1379 | 10.7443 |
| 42.500 | 7.0539 | 10.4641 |
| 43.000 | 6.9719 | 10.2018 |
| 43.500 | 6.8918 | 9.9555 |
| 44.000 | 6.8135 | 9.7237 |
| 44.500 | 6.7369 | 9.5050 |
| 45.000 | 6.6621 | 9.2982 |
| 45.500 | 6.5888 | 9.1022 |
| 46.000 | 6.5172 | 8.9161 |
| 46.500 | 6.4472 | 8.7392 |
| 47.000 | 6.3786 | 8.5706 |
| 47.500 | 6.3114 | 8.4097 |
| 48.000 | 6.2457 | 8.2561 |
| 48.500 | 6.1813 | 8.1090 |
| 49.000 | 6.1182 | 7.9682 |
| 49.500 | 6.0564 | 7.8331 |
| 50.000 | 5.9959 | 7.7033 |
| 50.500 | 5.9365 | 7.5786 |
| 51.000 | 5.8783 | 7.4587 |
| 51.500 | 5.8212 | 7.3431 |
| 52.000 | 5.7652 | 7.2317 |
| 52.500 | 5.7103 | 7.1242 |
| 53.000 | 5.6565 | 7.0204 |
| 53.500 | 5.6036 | 6.9201 |
| 54.000 | 5.5517 | 6.8231 |
| 54.500 | 5.5008 | 6.7292 |
| 55.000 | 5.4508 | 6.6383 |
| 55.500 | 5.4017 | 6.5501 |
| 56.000 | 5.3534 | 6.4647 |
| 56.500 | 5.3061 | 6.3817 |
| 57.000 | 5.2595 | 6.3012 |
| 57.500 | 5.2138 | 6.2230 |
| 58.000 | 5.1688 | 6.1470 |
| 58.500 | 5.1247 | 6.0731 |
| 59.000 | 5.0812 | 6.0012 |
| 59.500 | 5.0385 | 5.9312 |
| 60.000 | 4.9965 | 5.8630 |

## ● WRJ-620

JAN : RG-98/U
EIA : WR-15
Inner dimensions of waveguide
3.759×1.880(mm)
Cut-off wave length
=2a=7.518mm
Cut-off frequency
39.8766GHz
Frequency range
49.8~75.8GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 50.000 | 5.9958 | 9.9388 |
| 50.500 | 5.9365 | 9.6752 |
| 51.000 | 5.8783 | 9.4292 |
| 51.500 | 5.8212 | 9.1989 |
| 52.000 | 5.7652 | 8.9827 |
| 52.500 | 5.7103 | 8.7791 |
| 53.000 | 5.6565 | 8.5871 |
| 53.500 | 5.6036 | 8.4054 |
| 54.000 | 5.5517 | 8.2333 |
| 54.500 | 5.5008 | 8.0698 |
| 55.000 | 5.4508 | 7.9144 |
| 55.500 | 5.4017 | 7.7663 |
| 56.000 | 5.3534 | 7.6249 |
| 56.500 | 5.3061 | 7.4899 |
| 57.000 | 5.2595 | 7.3607 |
| 57.500 | 5.2138 | 7.2368 |
| 58.000 | 5.1688 | 7.1181 |
| 58.500 | 5.1247 | 7.0040 |
| 59.000 | 5.0812 | 6.8943 |
| 59.500 | 5.0385 | 6.7888 |
| 60.000 | 4.9965 | 6.6871 |
| 60.500 | 4.9552 | 6.5891 |
| 61.000 | 4.9146 | 6.4945 |
| 61.500 | 4.8747 | 6.4031 |
| 62.000 | 4.8354 | 6.3148 |
| 62.500 | 4.7967 | 6.2293 |
| 63.000 | 4.7586 | 6.1466 |
| 63.500 | 4.7211 | 6.0665 |
| 64.000 | 4.6843 | 5.9888 |
| 64.500 | 4.6479 | 5.9135 |
| 65.000 | 4.6122 | 5.8404 |
| 65.500 | 4.5770 | 5.7694 |
| 66.000 | 4.5423 | 5.7004 |
| 66.500 | 4.5082 | 5.6333 |
| 67.000 | 4.4745 | 5.5681 |
| 67.500 | 4.4414 | 5.5046 |
| 68.000 | 4.4087 | 5.4428 |
| 68.500 | 4.3765 | 5.3826 |
| 69.000 | 4.3448 | 5.3239 |
| 69.500 | 4.3136 | 5.2667 |
| 70.000 | 4.2827 | 5.2109 |
| 70.500 | 4.2524 | 5.1565 |
| 71.000 | 4.2224 | 5.1034 |
| 71.500 | 4.1929 | 5.0515 |
| 72.000 | 4.1638 | 5.0008 |
| 72.500 | 4.1351 | 4.9513 |
| 73.000 | 4.1067 | 4.9029 |
| 73.500 | 4.0788 | 4.8555 |
| 74.000 | 4.0512 | 4.8093 |
| 74.500 | 4.0241 | 4.7640 |
| 75.000 | 3.9972 | 4.7196 |

## ● WRJ—740

JAN : RG-99
EIA : WR-12
Inner dimensions of waveguide
3.099×1.549(mm)
Cut-off wave length
=2a=6.198mm
Cut-off frequency
48.36~92GHz
Frequency range
60.5~91.9GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 60.000 | 4.9965 | 8.4443 |
| 60.500 | 4.9552 | 8.2494 |
| 61.000 | 4.9146 | 8.0660 |
| 61.500 | 4.8747 | 7.8929 |
| 62.000 | 4.8354 | 7.7292 |
| 62.500 | 4.7967 | 7.5741 |
| 62.000 | 4.7586 | 7.4268 |
| 63.500 | 4.7211 | 7.2868 |
| 64.000 | 4.6843 | 7.1533 |
| 64.500 | 4.6479 | 7.0260 |
| 65.000 | 4.6122 | 6.9043 |
| 65.500 | 4.5770 | 6.7878 |
| 66.000 | 4.5423 | 6.6762 |
| 66.500 | 4.5082 | 6.5692 |
| 67.000 | 4.4745 | 6.4664 |
| 67.500 | 4.4414 | 6.3675 |
| 68.000 | 4.4087 | 6.2724 |
| 68.500 | 4.3765 | 6.1807 |
| 69.000 | 4.3448 | 6.0924 |
| 69.500 | 4.3136 | 6.0071 |
| 70.000 | 4.2827 | 5.9247 |
| 70.500 | 4.2524 | 5.8450 |
| 71.000 | 4.2224 | 5.7680 |
| 71.500 | 4.1929 | 5.6934 |
| 72.000 | 4.1638 | 5.6211 |
| 72.500 | 4.1351 | 5.5511 |
| 73.000 | 4.1067 | 5.4831 |
| 73.500 | 4.0788 | 5.4171 |
| 74.000 | 4.0512 | 5.3531 |
| 74.500 | 4.0241 | 5.2908 |

# Relation Table for Waveguides and Wave Lengths

| | | |
|---|---|---|
| 75.000 | 3.9972 | 5.2303 |
| 75.500 | 3.9708 | 5.1714 |
| 76.000 | 3.9446 | 5.1141 |
| 76.500 | 3.9189 | 5.0583 |
| 77.000 | 3.8934 | 5.0039 |
| 77.500 | 3.8683 | 4.9509 |
| 78.000 | 3.8435 | 4.8992 |
| 78.500 | 3.8190 | 4.8488 |
| 79.000 | 3.7948 | 4.7996 |
| 79.500 | 3.7710 | 4.7516 |
| 80.000 | 3.7474 | 4.7047 |
| 80.500 | 3.7241 | 4.6589 |
| 81.000 | 3.7011 | 4.6141 |
| 81.500 | 3.6784 | 4.5704 |
| 82.000 | 3.6560 | 4.5276 |
| 82.500 | 3.6338 | 4.4857 |
| 83.000 | 3.6120 | 4.4447 |
| 83.500 | 3.5903 | 4.4046 |
| 84.000 | 3.5690 | 4.3653 |
| 84.500 | 3.5478 | 4.3268 |
| 85.000 | 3.5270 | 4.2891 |
| 85.500 | 3.5063 | 4.2522 |
| 86.000 | 3.4860 | 4.2160 |
| 86.500 | 3.4658 | 4.1805 |
| 87.000 | 3.4459 | 4.1457 |
| 87.500 | 3.4262 | 4.1115 |
| 88.000 | 3.4067 | 4.0780 |
| 88.500 | 3.3875 | 4.0451 |
| 89.000 | 3.3685 | 4.0128 |
| 89.500 | 3.3496 | 3.9811 |
| 90.000 | 3.3310 | 3.9500 |

## ● WRJ-900

IEC : R-900
EIA : WR-10
Inner dimensions of waveguide
2.54×1.27(mm)
Cut-off wave length
=2a=5.080mm
Cut-off frequency
59.0143GHz
Frequency range
73.8～112.0GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 75.000 | 3.9972 | 6.4771 |
| 76.000 | 3.9446 | 6.2602 |
| 77.000 | 3.8934 | 6.0613 |
| 78.000 | 3.8435 | 5.8779 |
| 79.000 | 3.7948 | 5.7082 |
| 80.000 | 3.7474 | 5.5505 |
| 81.000 | 3.7011 | 5.4034 |
| 82.000 | 3.6560 | 5.2657 |
| 83.000 | 3.6120 | 5.1366 |
| 84.000 | 3.5690 | 5.0152 |
| 85.000 | 3.5270 | 4.9006 |
| 86.000 | 3.4860 | 4.7923 |
| 87.000 | 3.4459 | 4.6898 |
| 88.000 | 3.4067 | 4.5925 |
| 89.000 | 3.3685 | 4.5000 |
| 90.000 | 3.3310 | 4.4119 |
| 91.000 | 3.2944 | 4.3279 |
| 92.000 | 3.2586 | 4.2477 |
| 93.000 | 3.2236 | 4.1709 |
| 94.000 | 3.1893 | 4.0974 |

| | | |
|---|---|---|
| 95.000 | 3.1557 | 4.0269 |
| 96.000 | 3.1228 | 3.9593 |
| 97.000 | 3.0906 | 3.8943 |
| 98.000 | 3.0591 | 3.8318 |
| 99.000 | 3.0282 | 3.7716 |
| 100.000 | 2.9979 | 3.7136 |
| 101.000 | 2.9682 | 3.6576 |
| 102.000 | 2.9391 | 3.6035 |
| 103.000 | 2.9106 | 3.5513 |
| 104.000 | 2.8826 | 3.5008 |
| 105.000 | 2.8552 | 3.4520 |
| 106.000 | 2.8282 | 3.4047 |
| 107.000 | 2.8018 | 3.3589 |
| 108.000 | 2.7759 | 3.3144 |
| 109.000 | 2.7504 | 3.2713 |
| 100.000 | 2.7254 | 3.2295 |

## ● WRJ-1200

JAN : RG-138/U
IEC : R-1200
EIA : WR-8
Inner dimensions of waveguide
2.032×1.016(mm)
Cut-off wave length
=2a=4.064mm
Cut-off frequency
73.7678GHz
Frequency range
92.2～140.0GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 90.000 | 3.3310 | 5.8146 |
| 91.000 | 3.2944 | 5.6262 |
| 92.000 | 3.2586 | 5.4532 |
| 93.000 | 3.2236 | 5.2936 |
| 94.000 | 3.1893 | 5.1457 |
| 95.000 | 3.1557 | 5.0082 |
| 96.000 | 3.1228 | 4.8798 |
| 97.000 | 3.0906 | 4.7596 |
| 98.000 | 3.0591 | 4.6468 |
| 99.000 | 3.0282 | 4.5406 |
| 100.000 | 2.9979 | 4.4404 |
| 101.000 | 2.9682 | 4.3456 |
| 102.000 | 2.9391 | 4.2558 |
| 103.000 | 2.9106 | 4.1705 |
| 104.000 | 2.8826 | 4.0894 |
| 105.000 | 2.8552 | 3.0121 |
| 106.000 | 2.8282 | 3.9384 |
| 107.000 | 2.8018 | 3.8680 |
| 108.000 | 2.7759 | 3.8005 |
| 109.000 | 2.7504 | 3.7360 |
| 100.000 | 2.7254 | 3.6740 |
| 101.000 | 2.7008 | 3.6145 |
| 102.000 | 2.6767 | 3.5573 |
| 103.000 | 2.6530 | 3.5023 |
| 104.000 | 2.6298 | 3.4492 |
| 115.000 | 2.6069 | 3.3981 |
| 116.000 | 2.5844 | 3.3488 |
| 117.000 | 2.5623 | 3.3011 |
| 118.000 | 2.5406 | 3.2551 |
| 119.000 | 2.5193 | 3.2106 |
| 120.000 | 2.4983 | 3.1674 |
| 121.000 | 2.4776 | 3.1257 |
| 122.000 | 2.4573 | 3.0852 |
| 123.000 | 2.4373 | 3.0459 |
| 124.000 | 2.4177 | 3.0078 |

| | | |
|---|---|---|
| 125.000 | 2.3983 | 2.9708 |
| 126.000 | 2.3793 | 2.9349 |
| 127.000 | 2.3606 | 2.8999 |
| 128.000 | 2.3421 | 2.8659 |
| 129.000 | 2.3240 | 2.8329 |
| 130.000 | 2.3061 | 2.8007 |
| 131.000 | 2.2885 | 2.7693 |
| 132.000 | 2.2712 | 2.7387 |
| 133.000 | 2.2541 | 2.7089 |
| 134.000 | 2.2373 | 2.6799 |
| 135.000 | 2.2207 | 2.6515 |
| 136.000 | 2.2044 | 2.6239 |
| 137.000 | 2.1883 | 2.5969 |
| 138.000 | 2.1724 | 2.5705 |
| 139.000 | 2.1568 | 2.5447 |
| 140.000 | 2.1414 | 2.5195 |

## ● WRI-1400

JAN : RG-136/U
IEC : R-1400
EIA : WR-7
Inner dimensions of waveguide
1.651×0.826(mm)
Cut-off wave length
=2a=3.302mm
Cut-off frequency
90.7912GHz
Frequency range
114～173GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 110.000 | 2.7254 | 4.8272 |
| 111.000 | 2.7008 | 4.6946 |
| 112.000 | 2.6767 | 4.5713 |
| 113.000 | 2.6530 | 4.4562 |
| 114.000 | 2.6298 | 4.3485 |
| 115.000 | 2.6069 | 4.2474 |
| 116.000 | 2.5844 | 4.1522 |
| 117.000 | 2.5623 | 4.0624 |
| 118.000 | 2.5406 | 3.9775 |
| 119.000 | 2.5193 | 3.8970 |
| 120.000 | 2.4983 | 3.8207 |
| 121.000 | 2.4776 | 3.7480 |
| 122.000 | 2.4573 | 3.6788 |
| 123.000 | 2.4373 | 3.6128 |
| 124.000 | 2.4177 | 3.5497 |
| 125.000 | 2.3983 | 3.4893 |
| 126.000 | 2.3793 | 3.4314 |
| 127.000 | 2.3606 | 3.3759 |
| 128.000 | 2.3421 | 3.3226 |
| 129.000 | 2.3240 | 3.2714 |
| 130.000 | 2.3061 | 3.2221 |
| 131.000 | 2.2885 | 3.1746 |
| 132.000 | 2.2712 | 3.1288 |
| 133.000 | 2.2541 | 3.0846 |
| 134.000 | 2.2373 | 3.0419 |
| 135.000 | 2.2207 | 3.0006 |
| 136.000 | 2.2044 | 2.9607 |
| 137.000 | 2.1883 | 2.9221 |
| 138.000 | 2.1724 | 2.8846 |
| 139.000 | 2.1568 | 2.8483 |
| 140.000 | 2.1414 | 2.8131 |
| 141.000 | 2.1262 | 2.7790 |
| 142.000 | 2.1112 | 2.7458 |
| 143.000 | 2.0965 | 2.7135 |
| 144.000 | 2.0819 | 2.6822 |

| | | |
|---|---|---|
| 145.000 | 2.0675 | 2.6517 |
| 146.000 | 2.0534 | 2.6220 |
| 147.000 | 2.0394 | 2.5931 |
| 148.000 | 2.0256 | 2.5650 |
| 149.000 | 2.0120 | 2.5375 |
| 150.000 | 1.9986 | 2.5108 |
| 151.000 | 1.9854 | 2.4847 |
| 152.000 | 1.9723 | 2.4592 |
| 153.000 | 1.9594 | 2.4344 |
| 154.000 | 1.9467 | 2.4101 |
| 155.000 | 1.9341 | 2.3864 |
| 156.000 | 1.9217 | 2.3632 |
| 157.000 | 1.9095 | 2.3406 |
| 158.000 | 1.8974 | 2.3184 |
| 159.000 | 1.8855 | 2.2967 |
| 160.000 | 1.8737 | 2.2755 |
| 161.000 | 1.8621 | 2.2548 |
| 162.000 | 1.8506 | 2.2345 |
| 163.000 | 1.8392 | 2.2146 |
| 164.000 | 1.8280 | 2.1951 |
| 165.000 | 1.8169 | 2.1760 |
| 166.000 | 1.8060 | 2.1572 |
| 167.000 | 1.7952 | 2.1389 |
| 168.000 | 1.7845 | 2.1209 |
| 169.000 | 1.7739 | 2.1032 |
| 170.000 | 1.7635 | 2.0859 |

## ● WRI-1800

JAN : RG-135/U
IEC : R-1800
EIA : WR-5
Inner dimensions of waveguide
1.295×0.648(mm)
Cut-off wave length
=2a=2.590mm
Cut-off frequency
115.700GHz
Frequency range
145～220GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 140.000 | 2.1414 | 3.8042 |
| 141.000 | 2.1262 | 3.7210 |
| 142.000 | 2.1112 | 3.6424 |
| 143.000 | 2.0965 | 3.5681 |
| 144.000 | 2.0819 | 3.4978 |
| 145.000 | 2.0675 | 3.4309 |
| 146.000 | 2.0534 | 3.3673 |
| 147.000 | 2.0394 | 3.3068 |
| 148.000 | 2.0256 | 3.2490 |
| 149.000 | 2.0120 | 3.1938 |
| 150.000 | 1.9986 | 3.1409 |
| 151.000 | 1.9854 | 3.0903 |
| 152.000 | 1.9723 | 3.0417 |
| 153.000 | 1.9594 | 2.9950 |
| 154.000 | 1.9467 | 2.9502 |
| 155.000 | 1.9341 | 2.9070 |
| 156.000 | 1.9217 | 2.8654 |
| 157.000 | 1.9095 | 2.8253 |
| 158.000 | 1.8974 | 2.7866 |
| 159.000 | 1.8855 | 2.7492 |
| 160.000 | 1.8737 | 2.7131 |
| 161.000 | 1.8621 | 2.6781 |
| 162.000 | 1.8506 | 2.6442 |
| 163.000 | 1.8392 | 2.6114 |
| 164.000 | 1.8280 | 2.5796 |

# Relation Table for Waveguides and Wave Lengths

| | | |
|---|---|---|
| 165.000 | 1.8169 | 2.5488 |
| 166.000 | 1.8060 | 2.5188 |
| 167.000 | 1.7952 | 2.4897 |
| 168.000 | 1.7845 | 2.4614 |
| 169.000 | 1.7739 | 2.4339 |
| 170.000 | 1.7635 | 2.4072 |
| 171.000 | 1.7532 | 2.3812 |
| 172.000 | 1.7430 | 2.3558 |
| 173.000 | 1.7329 | 2.3311 |
| 174.000 | 1.7229 | 2.3070 |
| 175.000 | 1.7131 | 2.2836 |
| 176.000 | 1.7034 | 2.2607 |
| 177.000 | 1.6937 | 2.2383 |
| 178.000 | 1.6842 | 2.2165 |
| 179.000 | 1.6748 | 2.1952 |
| 180.000 | 1.6655 | 2.1743 |
| 181.000 | 1.6563 | 2.1540 |
| 182.000 | 1.6472 | 2.1341 |
| 183.000 | 1.6382 | 2.1146 |
| 184.000 | 1.6293 | 2.0956 |
| 185.000 | 1.6205 | 2.0769 |
| 186.000 | 1.6118 | 2.0587 |
| 187.000 | 1.6032 | 2.0408 |
| 188.000 | 1.5946 | 2.0233 |
| 189.000 | 1.5862 | 2.0062 |
| 190.000 | 1.5779 | 1.9893 |
| 191.000 | 1.5696 | 1.9729 |
| 192.000 | 1.5614 | 1.9567 |
| 193.000 | 1.5533 | 1.9409 |
| 194.000 | 1.5453 | 1.9253 |
| 195.000 | 1.5374 | 1.9100 |
| 196.000 | 1.5296 | 1.8951 |
| 197.000 | 1.5218 | 1.8804 |
| 198.000 | 1.5141 | 1.8659 |
| 199.000 | 1.5065 | 1.8517 |
| 200.000 | 1.4990 | 1.8378 |
| 201.000 | 1.4915 | 1.8241 |
| 202.000 | 1.4841 | 1.8106 |
| 203.000 | 1.4768 | 1.7974 |
| 204.000 | 1.4696 | 1.7844 |
| 205.000 | 1.4624 | 1.7716 |
| 206.000 | 1.4553 | 1.7590 |
| 207.000 | 1.4483 | 1.7467 |
| 208.000 | 1.4413 | 1.7345 |
| 209.000 | 1.4344 | 1.7225 |
| 210.000 | 1.4276 | 1.7107 |
| 211.000 | 1.4208 | 1.6991 |
| 212.000 | 1.4141 | 1.6877 |
| 213.000 | 1.4075 | 1.6764 |
| 214.000 | 1.4009 | 1.6654 |
| 215.000 | 1.3944 | 1.6544 |
| 216.000 | 1.3879 | 1.6437 |
| 217.000 | 1.3815 | 1.6331 |
| 218.000 | 1.3752 | 1.6227 |
| 219.000 | 1.3689 | 1.6124 |
| 220.000 | 1.3627 | 1.6022 |

## ● WRI-2200

JAN : RG-137／U
IEC : R-2200
EIA : WR-4
Inner dimensions of waveguide
1.092×0.546(mm)
Cut-off wave length
=2a=2.184mm
Cut-off frequency
137.2676GHz

Frequency range
172～261GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 170.000 | 1.7635 | 2.9883 |
| 171.500 | 1.7481 | 2.9150 |
| 173.000 | 1.7329 | 2.8463 |
| 174.500 | 1.7180 | 2.7817 |
| 176.000 | 1.7034 | 2.7208 |
| 177.500 | 1.6890 | 2.6633 |
| 179.000 | 1.6748 | 2.6088 |
| 180.500 | 1.6609 | 2.5571 |
| 182.000 | 1.6472 | 2.5080 |
| 183.500 | 1.6337 | 2.4612 |
| 185.000 | 1.6205 | 2.4166 |
| 186.500 | 1.6075 | 2.3740 |
| 188.000 | 1.5946 | 2.3333 |
| 189.500 | 1.5820 | 2.2943 |
| 191.000 | 1.5696 | 2.2569 |
| 192.500 | 1.5574 | 2.2209 |
| 194.000 | 1.5453 | 2.1864 |
| 195.500 | 1.5335 | 2.1532 |
| 197.000 | 1.5218 | 2.1213 |
| 198.500 | 1.5103 | 2.0904 |
| 200.000 | 1.4990 | 2.0607 |
| 201.500 | 1.4878 | 2.0320 |
| 203.000 | 1.4768 | 2.0043 |
| 204.500 | 1.4660 | 1.9774 |
| 206.000 | 1.4553 | 1.9515 |
| 207.500 | 1.4448 | 1.9263 |
| 209.000 | 1.4344 | 1.9019 |
| 210.500 | 1.4242 | 1.8783 |
| 212.000 | 1.4141 | 1.8554 |
| 213.500 | 1.4042 | 1.8331 |
| 215.000 | 1.3944 | 1.8115 |
| 216.500 | 1.3847 | 1.7904 |
| 218.000 | 1.3752 | 1.7700 |
| 219.500 | 1.3658 | 1.7501 |
| 221.000 | 1.3565 | 1.7307 |
| 222.500 | 1.3474 | 1.7118 |
| 224.000 | 1.3384 | 1.6934 |
| 225.500 | 1.3295 | 1.6755 |
| 227.000 | 1.3207 | 1.6580 |
| 228.500 | 1.3120 | 1.6410 |
| 230.000 | 1.3034 | 1.6243 |
| 231.500 | 1.2950 | 1.6081 |
| 233.000 | 1.2867 | 1.5922 |
| 234.500 | 1.2784 | 1.5767 |
| 236.000 | 1.2703 | 1.5615 |
| 237.500 | 1.2623 | 1.5467 |
| 239.000 | 1.2544 | 1.5322 |
| 240.500 | 1.2465 | 1.5180 |
| 242.000 | 1.2388 | 1.5041 |
| 243.500 | 1.2312 | 1.4905 |
| 245.000 | 1.2236 | 1.4772 |
| 246.500 | 1.2162 | 1.4641 |
| 248.000 | 1.2088 | 1.4513 |
| 249.500 | 1.2016 | 1.4388 |
| 251.000 | 1.1944 | 1.4265 |
| 252.500 | 1.1873 | 1.4145 |
| 254.000 | 1.1803 | 1.4027 |
| 255.500 | 1.1734 | 1.3911 |
| 257.000 | 1.1665 | 1.3797 |
| 258.500 | 1.1597 | 1.3685 |
| 260.000 | 1.1530 | 1.3576 |

## ● WRI-2600

JAN : RG-139／U
IEC : R-2600
EIA : WR-3
Inner dimensions of waveguide
0.864×0.432(mm)
Cut-off wave length
=2a=1.728mm
Cut-off frequency
173.4910GHz
Frequency range
217～330GHz

| f (GHz) | λ (mm) | λg (mm) |
|---|---|---|
| 220.000 | 1.3627 | 2.2178 |
| 221.500 | 1.3535 | 2.1786 |
| 223.000 | 1.3444 | 2.1413 |
| 224.500 | 1.3354 | 2.1055 |
| 226.000 | 1.3265 | 2.0713 |
| 227.500 | 1.3178 | 2.0385 |
| 229.000 | 1.3091 | 2.0069 |
| 230.500 | 1.3006 | 1.9766 |
| 232.000 | 1.2922 | 1.9475 |
| 233.500 | 1.2839 | 1.9194 |
| 235.000 | 1.2757 | 1.8923 |
| 236.500 | 1.2676 | 1.8662 |
| 238.000 | 1.2596 | 1.8410 |
| 239.500 | 1.2517 | 1.8166 |
| 241.000 | 1.2440 | 1.7931 |
| 242.500 | 1.2363 | 1.7703 |
| 244.000 | 1.2287 | 1.7482 |
| 245.500 | 1.2212 | 1.7267 |
| 247.000 | 1.2137 | 1.7060 |
| 248.500 | 1.2064 | 1.6858 |
| 250.000 | 1.1992 | 1.6662 |
| 251.500 | 1.1920 | 1.6472 |
| 253.000 | 1.1850 | 1.6287 |
| 254.500 | 1.1780 | 1.6107 |
| 256.000 | 1.1711 | 1.5932 |
| 257.500 | 1.1642 | 1.5761 |
| 259.000 | 1.1575 | 1.5595 |
| 260.500 | 1.1508 | 1.5433 |
| 262.000 | 1.1442 | 1.5275 |
| 263.500 | 1.1377 | 1.5122 |
| 265.000 | 1.1313 | 1.4971 |
| 266.500 | 1.1249 | 1.4825 |
| 268.000 | 1.1186 | 1.4681 |
| 269.500 | 1.1124 | 1.4542 |
| 271.000 | 1.1062 | 1.4405 |
| 272.500 | 1.1002 | 1.4271 |
| 274.000 | 1.0941 | 1.4140 |
| 275.500 | 1.0882 | 1.4012 |
| 277.000 | 1.0823 | 1.3887 |
| 278.500 | 1.0765 | 1.3765 |
| 280.000 | 1.0707 | 1.3645 |
| 281.500 | 1.0650 | 1.3527 |
| 283.000 | 1.0593 | 1.3412 |
| 284.500 | 1.0538 | 1.3299 |
| 286.000 | 1.0482 | 1.3189 |
| 287.500 | 1.0428 | 1.3080 |
| 289.000 | 1.0373 | 1.2974 |
| 290.500 | 1.0320 | 1.2870 |
| 292.000 | 1.0267 | 1.2767 |
| 293.500 | 1.0214 | 1.2667 |
| 295.000 | 1.0162 | 1.2568 |
| 296.500 | 1.0111 | 1.2471 |
| 298.000 | 1.0060 | 1.2376 |
| 299.500 | 1.0010 | 1.2283 |
| 301.000 | 0.9960 | 1.2191 |
| 302.500 | 0.9910 | 1.2101 |
| 304.000 | 0.9862 | 1.2012 |
| 305.500 | 0.9813 | 1.1925 |
| 307.000 | 0.9765 | 1.1839 |
| 308.500 | 0.9718 | 1.1755 |
| 310.000 | 0.9671 | 1.1672 |
| 311.500 | 0.9624 | 1.1590 |
| 313.000 | 0.9578 | 1.1510 |
| 314.500 | 0.9532 | 1.1431 |
| 316.000 | 0.9487 | 1.1353 |
| 317.500 | 0.9442 | 1.1277 |
| 319.000 | 0.9398 | 1.1201 |
| 320.500 | 0.9354 | 1.1127 |
| 322.000 | 0.9310 | 1.1054 |
| 323.500 | 0.9267 | 1.0982 |
| 325.000 | 0.9224 | 1.0911 |

# Attenuation in EIAJ Type Waveguides (Theoretical values) WRI type

$\delta = 5.8 \times 10^7$ mho/m (copper)