**텍스트, 클립아트이(가) 표시된 사진

자동 생성된 설명**

**APT REPORT ON**

**SURVEY STUDY ON FREQUENCY USAGE OF THE BANDS 108 – 117.975 MHZ, AND 960 – 1 164 MHZ FOR AERONAUTICAL RADIONAVIGATION SERVICE IN APT REGION**

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***(Source: AWG-21/OUT-10)***

**No. APT/AWG/REP-69**

# Introduction

In APT countries, the 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz frequency bands are commonly used for aeronautical radionavigation systems. Therefore there is a necessity to share information on radio frequency channel arrangements for these bands in order to facilitate the efficient usage, border coordination on these frequencies among APT countries.

This survey report collected the information of current usage, regulation and especially the frequency channel arrangement of the bands 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz for aeronautical radionavigation systems in Asia Pacific region. The information is based on the response to the Questionnaire of AWG19/OUT-02(Rev.1).

# Summary of the questionnaire

The questionnaire includes four questions. During the AWG-20 meeting held in Bangkok, Thailand, five administrations responded the questionnaire, they are: China, Republic of Indonesia, Islamic Rep. of Iran, Japan, New Zealand, Thailand and Viet Nam. During the AWG-21 meeting held in Bangkok, Thailand, China and Republic of Indonesia responded the questionnaire. The detailed response could be found in the following input contributions:

|  |  |
| --- | --- |
| AWG-20 | http:// www.aptsec.org/2016-AWG20-DOCS-INP |
| AWG-21 | http://www.aptsec.org/2017-AWG21-DOCS-INP |
| China | AWG-21-INP-37 |
| Republic of Indonesia | AWG-21-INP-84 |
| the Islamic Rep. of Iran | AWG-20-INP-24 |
| Japan | AWG-20-INP-15 |
| New Zealand | AWG-20-INP-22 |
| Thailand | AWG-20-INP-94Rev.1 |
| Viet Nam | AWG-20-INP-93 |

The Task Group Aeronautical and Maritime under the Working Group Service and Application wish the information collected in this survey report can be helpful for APT member’s relevant study.

# Administration Profile

**China**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Ministry of Industry and Information Technology (MIIT) |
| Name of contact person | DING Jiaxin |
| Postal Address | 13 West Chang’an Ave. Beijing, China, 100804 |
| Phone | +86 10 68009084 |
| Email Address | dingjiaxin@srrc.org.cn |

**Republic of Indonesia**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Ministry of Communication and Informatics |
| Name of contact person | Yudhistira Prayoga |
| Address | Gedung Menara Merdeka Lantai 10 JL. Budi Kemulyaan Jakarta Pusat |
| Phone | +021 29576465 |
| Email | [yudhistira.prayoga@postel.go.id](mailto:yudhistira.prayoga@postel.go.id) |

**The Islamic Rep. of Iran**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Communications Regulatory Authority of The I.R of IRAN |
| Name of contact person | Alireza Dar​vishi |
| Postal Address | No. 17; Before The Seyyed Khandan Bridge; Shariati ST.; Tehran - Iran. |
| Phone | +98 21 88112809 |
| Email Address | darvishi@cra.ir |

**Japan**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Ministry of Internal Aiiairs and Communications |
| Name of contact person | Masahiro Okui |
| Postal Address | 2-1-2 Kasumigaseki Chiyoda Ku Tokyo Japan |
| Phone | +81 3 5253 5816 |
| Email Address | :m.okui@soumu.go.jp |

**New Zealand**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Ministry of Business, Innovation and Employment (MBIE) |
| Name of contact person | Nima Farhang |
| Postal Address | Po Box 2847, Wellington, 6011, New Zealand |
| Phone | +64 4 901 1211 |
| Email Address | radio.spectrum@mbie.govt.nz |

**Thailand**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Office of The National Broadcasting and Telecommunication Commission (NBTC) |
| Name of contact person | Dr. Thirapiroon Thongkamwitoon |
| Postal Address | 87 Phaholythin 8 (Soi Sailom), Samsen Nai, Phayathai, Bangkok 10400. Thailand |
| Phone | +66939242656 |
| Email Address | [thirapiroon.t@nbtc.go.th](mailto:thirapiroon.t@nbtc.go.th) |

**Viet Nam**

|  |  |
| --- | --- |
| Name of the Administration/ Institution/Company | Authority of Radio Frequency Management-MIC Viet Nam |
| Name of contact person | Nguyen Minh Tuan |
| Postal Address | 115 Tran Duy Hung, Ha Noi, Viet Nam |
| Phone | +84 4 3556 4981 |
| Email Address | tuannm@rfd.gov.vn |

# Questionnaire results

1. What are the national frequency allocations (e.g. Aeronautical Radionavigation Service, Mobile Service, Aeronautical Mobile Service,…) within the listed band in your country? What is the regulation, especially the specific details on the service operations in your country (e.g. internal country footnote, specific regulation, guideline for application)?

**China**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | AERONAUTICAL RADIONAVIGATION SERVICE | * Instrument landing system (ILS) localizer * VHF Omni-directional Radio Range (VOR) | ICAO Annex 10   * ILS localizer on 108-112MHz * VOR on 108-117.975MHz |
| 2 | 328.6 – 335.4 | AERONAUTICAL RADIONAVIGATION SERVICE | Instrument landing system (ILS) glide path | ICAO Annex 10 |
| 3 | 960 – 1164 | AERONAUTICAL RADIONAVIGATION SERVICE  Aeronautical mobile (R) | * Distance Measuring Equipment (DME) * Secondary Surveillance Radars (SSR) * Tactical Air Navigation (TACAN) | ICAO Annex 10   * DME and TACAN on 960-1164MHz * SSR on 1030MHz and 1090MHz |

**Republic of Indonesia**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | AERONAUTICAL RADIONAVIGATION |  | Decission No. 10 year 2009 of the Ministry of Transportation on the Civil Aviation Safety Regulations Part 171 on Aeronautical Teleceommunication Service and Radio Navigation Service Providers |
| 2 | 328.6 – 335.4 | AERONAUTICAL RADIONAVIGATION |  | Decission No. 10 year 2009 of the Ministry of Transportation on the Civil Aviation Safety Regulations Part 171 on Aeronautical Teleceommunication Service and Radio Navigation Service Providers |
| 3 | 960 – 1164 | AERONAUTICAL MOBILE (R)  AERONAUTICAL RADIO NAVIGATION |  | Decission No. 10 year 2009 of the Ministry of Transportation on the Civil Aviation Safety Regulations Part 171 on Aeronautical Teleceommunication Service and Radio Navigation Service Providers |

**The Islamic Rep. of Iran**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | AERONAUTICAL RADIONAVIGATION | VDL mode 4 / ILS / VOR-DVOR / GBAS | - |
| 2 | 328.6 – 335.4 | AERONAUTICAL RADIONAVIGATION | ILS - Glide Path | - |
| 3 | 960 – 1164 | AERONAUTICAL RADIONAVIGATION / AERONAUTICAL MOBILE | DME / SSR / ACAS / ADS-B / MIDS /  UAT / TACAN / LDACS | - |

**Japan**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | Aeronautical radionavigation service | ILS localizer  VOR | ILS localizer and VOR shall be used, and assignment is subject to table of Frequencies for Radio Stations Using ACAS, Aeronautical DME, TACAN, VOR, ILS, MLS, and ATCRBS\*.  \*This table is described at the answer for Question 4 of this paper. |
| 2 | 328.6 – 335.4 | Aeronautical radionavigation service | ILS Glide Path | ILS Glide Path shall be used, and assignment is subject to table of Frequencies for Radio Stations Using ACAS, Aeronautical DME, TACAN, VOR, ILS, MLS, and ATCRBS\*  \*This table is described at the answer for Question 4 of this paper. |
| 3 | 960 – 1164 | Aeronautical radionavigation service | Aeronautical DME  TACAN  ATCRBS  ACAS | Aeronautical DME, TACAN, ATCRBS, and ACAS shall be used, and assignment is subject to table of Frequencies for Radio Stations Using ACAS, Aeronautical DME, TACAN, VOR, ILS, MLS, and ATCRBS\*  \*This table is described at the answer for Question 4 of this paper. |

**New Zealand**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | Aeronautical Radionavigation | * Instrument landing system (ILS) localisers * VHF Omni-directional Radio Range (VOR) * Doppler VOR (DVOR) | ICAO Annex 10 |
| 2 | 328.6 – 335.4 | Aeronautical Radionavigation | * Instrument landing system (ILS) glide path transmitters | ICAO Annex 10 |
| 3 | 960 – 1164 | Aeronautical Radionavigation | * Distance Measuring Equipment (DME) * Secondary Surveillance Radars (SSR) | ICAO Annex 10 |

**Thailand**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | ARNS | Localizer, VOR/ICAO | Global allocation |
| 2 | 328.6 – 335.4 | ARNS | Glide Slope/ICAO | Global allocation |
| 3 | 960 – 1164 | ARNS/AM(R)S | DME,SSR,ADS-B, ACAS/ICAO | Global allocation |

**Viet Nam**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bands (MHz)** | **Service** | **System / Standard** | **Specific regulation** |
| 1 | 108 – 117.975 | AERONAUTICAL RADIO NAVIGATION | ILS Localizer/ ICAO standard | **Circular** 01/2012/TTLT-BTTTT-BGTVT: Providing guidance on procedures for the issuance of licenses for radio stations in Aeronautical Mobile Service and Aeronautical Radionavigation Service  **VietNamese standard TCCS 05:2009/CHK**, Pursuant to Deputy of The Civil Aviation Authority’s Decision No1638/QĐ-CHK: Provide the standard for the radio navigation aid systems in VietNam |
| 2 | 328.6 – 335.4 | AERONAUTICAL RADIO NAVIGATION | ILS Glidepath/ ICAO standard | **Circular** 01/2012/TTLT-BTTTT-BGTVT  **VietNamese standard TCCS 05:2009/CHK**, Pursuant to Deputy of The Civil Aviation Authority’s Decision No1638/QĐ-CHK: Provide the standard for the radio navigation aid systems in VietNam |
| 3 | 960 – 1164 | AERONAUTICAL MOBILE (R)  AERONAUTICAL RADIO NAVIGATION | DME/ ICAO standard | **Circular** 01/2012/TTLT-BTTTT-BGTVT: Providing guidance on procedures for the issuance of licenses for radio stations in Aeronautical Mobile Service and Aeronautical Radionavigation Service  **VietNamese standard TCCS 05:2009/CHK**, Pursuant to Deputy of The Civil Aviation Authority’s Decision No1638/QĐ-CHK: Provide the standard for the radio navigation aid systems in VietNam  VTN8A The use of 960-1164 MHz frequency band for Aeronautical Mobile Service (R) is limited to the operating systems to comply with international aviation standards. This use shall comply with Resolution 417 (Rev.WRC-12). When set a frequency for Aviation Mobile Service (R), it should pay attention to coordination to ensure not to cause interference to the service of Aeronautical navigation radio service has been deployed in this frequency band. |

1. Which organization is in charge of frequency assignment for the Aeronautical Radionavigation Service (ARNS) stations: *(Please select the appropriate organization)*

* Radio Frequency Agency
* Civil Aviation Agency
* Other organization (name if any)

Please provide the national regulation and procedure, in detail (if any), for the frequency assignment in the frequency bands 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz.

|  |  |
| --- | --- |
| China | Civil Aviation Administration of China is in charge of frequency assignment for the Aeronautical Radionavigation Service (ARNS) stations in the frequency bands 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz. |
| Republic of Indonesia | Radio Frequency Agency is in charge of frequency assignment, and the frequency assignment is in accordance to the Decission No. 10 year 2009 of the Ministry of Transportation on the Civil Aviation Safety Regulations Part 171 on Aeronautical Teleceommunication Service and Radio Navigation Service Providers. |
| The Islamic Rep. of Iran | All requests for implementation of radio networks in above frequency bands are considered by Iranian Airport Company. Technical parameters including frequency channels are determined by technical assessment and will be announced to regulator for issuing the related license. |
| New Zealand | The frequency bands 108–117.975 MHz, 328.6–335.4 MHz and 960–1164 MHz are allocated to Aeronautical Radionavigation Service in New Zealand.  Anyone operating aeronautical radio transmitting equipment in these bands within New Zealand must hold an appropriate radio operator’s qualification administered by the Civil Aviation Authority (CAA).  The radio transmitting equipment operating in these bands are divided into the following two groups and regulated accordingly:   * Aeronautical radio transmitters, including portable radio transmitters and on-board aircraft transmitters, within territorial limits of New Zealand are covered by [*General User Radio License for Aeronautical Purposes*](http://www.rsm.govt.nz/about-rsm/spectrum-policy/gazette/gurl/aeronautical-purposes) and are **not** required to be individually licensed. * Aeronautical fixed base station or repeater station transmitter would require an [aeronautical fixed land station licence](http://www.rsm.govt.nz/licensing/types-of-licences/aeronautical-aircraft-licences). In order to apply for such licence, it is required to contact an approved radio engineer or certifier ([ARE/ARC](http://www.rsm.govt.nz/licensing/list-of-engineers-examiners/rsm-approved-are-arc-available)) and follow the procedure as illustrated below: |
| Thailand | The frequency bands 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz are exclusively allocated to ARNS/AM(R)S in Thailand and used solely by Aeronautical Radio of Thailand, Ltd (AEROTHAI). Frequency assignment and licensing are on a first-come first-served basis. The license duration covers one year and is renewable. |
| Viet Nam | Circular 01/2012/TTLT-BTTTT-BGTVT between MIC and MOT providing guidance on procedures for the issuance of licenses for radio stations in Aeronautical Mobile Service and Aeronautical Radionavigation Service  The Civil Aviation Authority carries out:   * the international coordination with the International civil aviation organization (ICAO). * the cooperation with the applicant to deploy the test of transmit and receive frequency if necessary, under the agreement ofthe Authority of Radio Frequency Management. * written response to the Authority of Radio Frequency Management on the coordination results, which include the frequency and the identity of the station in case of successful coordination or explanation on the unsuccessful of coordination.   Base on the coordination results from Civil Aviation Authority, the Authority of Radio Frequency Management do the domestic interference analysis and then the frequency assignment. |

1. Please provide the frequency channel arrangements are currently using in the frequency bands 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz for aeronautical radionavigation systems in your country.

|  |  |
| --- | --- |
| China | Frequency channel arrangements in the frequency bands 108–117.975 MHz, 328.6–335.4 MHz and 960–1164 MHz are in line with ICAO Annex 10. |
| The Islamic Rep. of Iran | All Frequency channel arrangements in the frequency bands 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz are according with Annex 10 of ICAO. |
| New Zealand | Frequency channel arrangements in the frequency bands 108–117.975 MHz, 328.6–335.4 MHz and 960–1164 MHz are in line with ICAO Annex 10. |
| Thailand | The frequency channel arrangements for the 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz bands follows the channel arrangements set by ICAO in its Standard and Recommended Practices (SARPs), Annex 10 - Aeronautical Telecommunications, Volume 1 - Radio Navigation Aids. The Annex is part of the Convention on International Civil Aviation or Chicago Convention. |

**JAPAN**

Table of Frequencies for Radio Stations Using ACAS, Aeronautical DME, TACAN, VOR, ILS, MLS, and ATCRBS:

1. VOR, ILS localizer, ILS glide path, MLS angle, Airborne TACAN, Ground-based DME and Ground-based TACAN

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Channel | Frequencies (MHz) | | | | |
| VOR or ILS localizer | ILS glide oath | MLS angle | Airborne DME and TACAN | Ground-based DME and TACAN |
| 1X | － | － | － | 1025 | 962 |
|  |  |  |  |  |  |
| 1Y | － | － | － | 1025 | 1088 |
|  |  |  |  |  |  |
| 2X | － | － | － | 1026 | 963 |
|  |  |  |  |  |  |
| 2Y | － | － | － | 1026 | 1089 |
|  |  |  |  |  |  |
| 3X | － | － | － | 1027 | 964 |
|  |  |  |  |  |  |
| 3Y | － | － | － | 1027 | 1090 |
|  |  |  |  |  |  |
| 4X | － | － | － | 1028 | 965 |
|  |  |  |  |  |  |
| 4Y | － | － | － | 1028 | 1091 |
|  |  |  |  |  |  |
| 5X | － | － | － | 1029 | 966 |
|  |  |  |  |  |  |
| 5Y | － | － | － | 1029 | 1092 |
|  |  |  |  |  |  |
| 6X | － | － | － | 1030 | 967 |
|  |  |  |  |  |  |
| 6Y | － | － | － | 1030 | 1093 |
|  |  |  |  |  |  |
| 7X | － | － | － | 1031 | 968 |
|  |  |  |  |  |  |
| 7Y | － | － | － | 1031 | 1094 |
|  |  |  |  |  |  |
| 8X | － | － | － | 1032 | 969 |
|  |  |  |  |  |  |
| 8Y | － | － | － | 1032 | 1095 |
|  |  |  |  |  |  |
| 9X | － | － | － | 1033 | 970 |
|  |  |  |  |  |  |
| 9Y | － | － | － | 1033 | 1096 |
|  |  |  |  |  |  |
| 10X | － | － | － | 1034 | 971 |
|  |  |  |  |  |  |
| 10Y | － | － | － | 1034 | 1097 |
|  |  |  |  |  |  |
| 11X | － | － | － | 1035 | 972 |
|  |  |  |  |  |  |
| 11Y | － | － | － | 1035 | 1098 |
|  |  |  |  |  |  |
| 12X | － | － | － | 1036 | 973 |
|  |  |  |  |  |  |
| 12Y | － | － | － | 1036 | 1099 |
|  |  |  |  |  |  |
| 13X | － | － | － | 1037 | 974 |
|  |  |  |  |  |  |
| 13Y | － | － | － | 1037 | 1100 |
|  |  |  |  |  |  |
| 14X | － | － | － | 1038 | 975 |
|  |  |  |  |  |  |
| 14Y | － | － | － | 1038 | 1101 |
|  |  |  |  |  |  |
| 15X | － | － | － | 1039 | 976 |
|  |  |  |  |  |  |
| 15Y | － | － | － | 1039 | 1102 |
|  |  |  |  |  |  |
| 16X | － | － | － | 1040 | 977 |
|  |  |  |  |  |  |
| 16Y | － | － | － | 1040 | 1103 |
|  |  |  |  |  |  |
| 17X | 108 | － | － | 1041 | 978 |
|  |  |  |  |  |  |
| 17Y | 108.05 | － | 5043 | 1041 | 1104 |
|  |  |  |  |  |  |
| 17Z | － | － | 5043.3 | 1041 | 1104 |
|  |  |  |  |  |  |
| 18X | \*108.10 | 334.7 | 5031 | 1042 | 979 |
|  |  |  |  |  |  |
| 18W | － | － | 5031.3 | 1042 | 979 |
|  |  |  |  |  |  |
| 18Y | \*108.15 | 334.55 | 5043.6 | 1042 | 1105 |
|  |  |  |  |  |  |
| 18Z | － | － | 5043.9 | 1042 | 1105 |
|  |  |  |  |  |  |
| 19X | 108.2 | － | － | 1043 | 980 |
|  |  |  |  |  |  |
| 19Y | 108.25 | － | 5044.2 | 1043 | 1106 |
|  |  |  |  |  |  |
| 19Z | － | － | 5044.5 | 1043 | 1106 |
|  |  |  |  |  |  |
| 20X | \*108.30 | 334.1 | 5031.6 | 1044 | 981 |
|  |  |  |  |  |  |
| 20W | － | － | 5031.9 | 1044 | 981 |
|  |  |  |  |  |  |
| 20Y | \*108.35 | 333.95 | 5044.8 | 1044 | 1107 |
|  |  |  |  |  |  |
| 20Z | － | － | 5045.1 | 1044 | 1107 |
|  |  |  |  |  |  |
| 21X | 108.4 | － | － | 1045 | 982 |
|  |  |  |  |  |  |
| 21Y | 108.45 | － | 5045.4 | 1045 | 1108 |
|  |  |  |  |  |  |
| 21Z | － | － | 5045.7 | 1045 | 1108 |
|  |  |  |  |  |  |
| 22X | \*108.50 | 329.9 | 5032.2 | 1046 | 983 |
|  |  |  |  |  |  |
| 22W | － | － | 5032.5 | 1046 | 983 |
|  |  |  |  |  |  |
| 22Y | \*108.55 | 329.75 | 5046 | 1046 | 1109 |
|  |  |  |  |  |  |
| 22Z | － | － | 5046.3 | 1046 | 1109 |
|  |  |  |  |  |  |
| 23X | 108.6 | － | － | 1047 | 984 |
|  |  |  |  |  |  |
| 23Y | 108.65 | － | 5046.6 | 1047 | 1110 |
|  |  |  |  |  |  |
| 23Z | － | － | 5046.9 | 1047 | 1110 |
|  |  |  |  |  |  |
| 24X | \*108.70 | 330.5 | 5032.8 | 1048 | 985 |
|  |  |  |  |  |  |
| 24W | － | － | 5033.1 | 1048 | 985 |
|  |  |  |  |  |  |
| 24Y | \*108.75 | 330.35 | 5047.2 | 1048 | 1111 |
|  |  |  |  |  |  |
| 24Z | － | － | 5047.5 | 1048 | 1111 |
|  |  |  |  |  |  |
| 25X | 108.8 | － | － | 1049 | 986 |
|  |  |  |  |  |  |
| 25Y | 108.85 | － | 5047.8 | 1049 | 1112 |
|  |  |  |  |  |  |
| 25Z | － | － | 5048.1 | 1049 | 1112 |
|  |  |  |  |  |  |
| 26X | \*108.90 | 329.3 | 5033.4 | 1050 | 987 |
|  |  |  |  |  |  |
| 26W | － | － | 5033.7 | 1050 | 987 |
|  |  |  |  |  |  |
| 26Y | \*108.95 | 329.15 | 5048.4 | 1050 | 1113 |
|  |  |  |  |  |  |
| 26Z | － | － | 5048.7 | 1050 | 1113 |
|  |  |  |  |  |  |
| 27X | 109 | － | － | 1051 | 988 |
|  |  |  |  |  |  |
| 27Y | 109.05 | － | 5049 | 1051 | 1114 |
|  |  |  |  |  |  |
| 27Z | － | － | 5049.3 | 1051 | 1114 |
|  |  |  |  |  |  |
| 28X | \*109.10 | 331.4 | 5034 | 1052 | 989 |
|  |  |  |  |  |  |
| 28W | － | － | 5034.3 | 1052 | 989 |
|  |  |  |  |  |  |
| 28Y | \*109.15 | 331.25 | 5049.6 | 1052 | 1115 |
|  |  |  |  |  |  |
| 28Z | － | － | 5049.9 | 1052 | 1115 |
|  |  |  |  |  |  |
| 29X | 109.2 | － | － | 1053 | 990 |
|  |  |  |  |  |  |
| 29Y | 109.25 | － | 5050.2 | 1053 | 1116 |
|  |  |  |  |  |  |
| 29Z | － | － | 5050.5 | 1053 | 1116 |
|  |  |  |  |  |  |
| 30X | \*109.30 | 332 | 5034.6 | 1054 | 991 |
|  |  |  |  |  |  |
| 30W | － | － | 5034.9 | 1054 | 991 |
|  |  |  |  |  |  |
| 30Y | \*109.35 | 331.85 | 5050.8 | 1054 | 1117 |
|  |  |  |  |  |  |
| 30Z | － | － | 5051.1 | 1054 | 1117 |
|  |  |  |  |  |  |
| 31X | 109.4 | － | － | 1055 | 992 |
|  |  |  |  |  |  |
| 31Y | 109.45 | － | 5051.4 | 1055 | 1118 |
|  |  |  |  |  |  |
| 31Z | － | － | 5051.7 | 1055 | 1118 |
|  |  |  |  |  |  |
| 32X | \*109.50 | 332.6 | 5035.2 | 1056 | 993 |
|  |  |  |  |  |  |
| 32W | － | － | 5035.5 | 1056 | 993 |
|  |  |  |  |  |  |
| 32Y | \*109.55 | 332.45 | 5052 | 1056 | 1119 |
|  |  |  |  |  |  |
| 32Z | － | － | 5052.3 | 1056 | 1119 |
|  |  |  |  |  |  |
| 33X | 109.6 | － | － | 1057 | 994 |
|  |  |  |  |  |  |
| 33Y | 109.65 | － | 5052.6 | 1057 | 1120 |
|  |  |  |  |  |  |
| 33Z | － | － | 5052.9 | 1057 | 1120 |
|  |  |  |  |  |  |
| 34X | \*109.70 | 333.2 | 5035.8 | 1058 | 995 |
|  |  |  |  |  |  |
| 34W | － | － | 5036.1 | 1058 | 995 |
|  |  |  |  |  |  |
| 34Y | \*109.75 | 333.05 | 5053.2 | 1058 | 1121 |
|  |  |  |  |  |  |
| 34Z | － | － | 5053.5 | 1058 | 1121 |
|  |  |  |  |  |  |
| 35X | 109.8 | － | － | 1059 | 996 |
|  |  |  |  |  |  |
| 35Y | 109.85 | － | 5053.8 | 1059 | 1122 |
|  |  |  |  |  |  |
| 35Z | － | － | 5054.1 | 1059 | 1122 |
|  |  |  |  |  |  |
| 36X | \*109.90 | 333.8 | 5036.4 | 1060 | 997 |
|  |  |  |  |  |  |
| 36W | － | － | 5036.7 | 1060 | 997 |
|  |  |  |  |  |  |
| 36Y | \*109.95 | 333.65 | 5054.4 | 1060 | 1123 |
|  |  |  |  |  |  |
| 36Z | － | － | 5054.7 | 1060 | 1123 |
|  |  |  |  |  |  |
| 37X | 110 | － | － | 1061 | 998 |
|  |  |  |  |  |  |
| 37Y | 110.05 | － | 5055 | 1061 | 1124 |
|  |  |  |  |  |  |
| 37Z | － | － | 5055.3 | 1061 | 1124 |
|  |  |  |  |  |  |
| 38X | \*110.10 | 334.4 | 5037 | 1062 | 999 |
|  |  |  |  |  |  |
| 38W | － | － | 5037.3 | 1062 | 999 |
|  |  |  |  |  |  |
| 38Y | \*110.15 | 334.25 | 5055.6 | 1062 | 1125 |
|  |  |  |  |  |  |
| 38Z | － | － | 5055.9 | 1062 | 1125 |
|  |  |  |  |  |  |
| 39X | 110.2 | － | － | 1063 | 1000 |
|  |  |  |  |  |  |
| 39Y | 110.25 | － | 5056.2 | 1063 | 1126 |
|  |  |  |  |  |  |
| 39Z | － | － | 5056.5 | 1063 | 1126 |
|  |  |  |  |  |  |
| 40X | \*110.30 | 335 | 5037.6 | 1064 | 1001 |
|  |  |  |  |  |  |
| 40W | － | － | 5037.9 | 1064 | 1001 |
|  |  |  |  |  |  |
| 40Y | \*110.35 | 334.85 | 5056.8 | 1064 | 1127 |
|  |  |  |  |  |  |
| 40Z | － | － | 5057.1 | 1064 | 1127 |
|  |  |  |  |  |  |
| 41X | 110.4 | － | － | 1065 | 1002 |
|  |  |  |  |  |  |
| 41Y | 110.45 | － | 5057.4 | 1065 | 1128 |
|  |  |  |  |  |  |
| 41Z | － | － | 5057.7 | 1065 | 1128 |
|  |  |  |  |  |  |
| 42X | \*110.50 | 329.6 | 5038.2 | 1066 | 1003 |
|  |  |  |  |  |  |
| 42W | － | － | 5038.5 | 1066 | 1003 |
|  |  |  |  |  |  |
| 42Y | \*110.55 | 329.45 | 5058 | 1066 | 1129 |
|  |  |  |  |  |  |
| 42Z | － | － | 5058.3 | 1066 | 1129 |
|  |  |  |  |  |  |
| 43X | 110.6 | － | － | 1067 | 1004 |
|  |  |  |  |  |  |
| 43Y | 110.65 | － | 5058.6 | 1067 | 1130 |
|  |  |  |  |  |  |
| 43Z | － | － | 5058.9 | 1067 | 1130 |
|  |  |  |  |  |  |
| 44X | \*110.70 | 330.2 | 5038.8 | 1068 | 1005 |
|  |  |  |  |  |  |
| 44W | － | － | 5039.1 | 1068 | 1005 |
|  |  |  |  |  |  |
| 44Y | \*110.75 | 330.05 | 5059.2 | 1068 | 1131 |
|  |  |  |  |  |  |
| 44Z | － | － | 5059.5 | 1068 | 1131 |
|  |  |  |  |  |  |
| 45X | 110.8 | － | － | 1069 | 1006 |
|  |  |  |  |  |  |
| 45Y | 110.85 | － | 5059.8 | 1069 | 1132 |
|  |  |  |  |  |  |
| 45Z | － | － | 5060.1 | 1069 | 1132 |
|  |  |  |  |  |  |
| 46X | \*110.90 | 330.8 | 5039.4 | 1070 | 1007 |
|  |  |  |  |  |  |
| 46W | － | － | 5039.7 | 1070 | 1007 |
|  |  |  |  |  |  |
| 46Y | \*110.95 | 330.65 | 5060.4 | 1070 | 1133 |
|  |  |  |  |  |  |
| 46Z | － | － | 5060.7 | 1070 | 1133 |
|  |  |  |  |  |  |
| 47X | 111 | － | － | 1071 | 1008 |
|  |  |  |  |  |  |
| 47Y | 111.05 | － | 5061 | 1071 | 1134 |
|  |  |  |  |  |  |
| 47Z | － | － | 5061.3 | 1071 | 1134 |
|  |  |  |  |  |  |
| 48X | \*111.10 | 331.7 | 5040 | 1072 | 1009 |
|  |  |  |  |  |  |
| 48W | － | － | 5040.3 | 1072 | 1009 |
|  |  |  |  |  |  |
| 48Y | \*111.15 | 331.55 | 5061.6 | 1072 | 1135 |
|  |  |  |  |  |  |
| 48Z | － | － | 5061.9 | 1072 | 1135 |
|  |  |  |  |  |  |
| 49X | 111.2 | － | － | 1073 | 1010 |
|  |  |  |  |  |  |
| 49Y | 111.25 | － | 5062.2 | 1073 | 1136 |
|  |  |  |  |  |  |
| 49Z | － | － | 5062.5 | 1073 | 1136 |
|  |  |  |  |  |  |
| 50X | \*111.30 | 332.3 | 5040.6 | 1074 | 1011 |
|  |  |  |  |  |  |
| 50W | － | － | 5040.9 | 1074 | 1011 |
|  |  |  |  |  |  |
| 50Y | \*111.35 | 332.15 | 5062.8 | 1074 | 1137 |
|  |  |  |  |  |  |
| 50Z | － | － | 5063.1 | 1074 | 1137 |
|  |  |  |  |  |  |
| 51X | 111.4 | － | － | 1075 | 1012 |
|  |  |  |  |  |  |
| 51Y | 111.45 | － | 5063.4 | 1075 | 1138 |
|  |  |  |  |  |  |
| 51Z | － | － | 5063.7 | 1075 | 1138 |
|  |  |  |  |  |  |
| 52X | \*111.50 | 332.9 | 5041.2 | 1076 | 1013 |
|  |  |  |  |  |  |
| 52W | － | － | 5041.5 | 1076 | 1013 |
|  |  |  |  |  |  |
| 52Y | \*111.55 | 332.75 | 5064 | 1076 | 1139 |
|  |  |  |  |  |  |
| 52Z | － | － | 5064.3 | 1076 | 1139 |
|  |  |  |  |  |  |
| 53X | 111.6 | － | － | 1077 | 1014 |
|  |  |  |  |  |  |
| 53Y | 111.65 | － | 5064.6 | 1077 | 1140 |
|  |  |  |  |  |  |
| 53Z | － | － | 5064.9 | 1077 | 1140 |
|  |  |  |  |  |  |
| 54X | \*111.70 | 333.5 | 5041.8 | 1078 | 1015 |
|  |  |  |  |  |  |
| 54W | － | － | 5042.1 | 1078 | 1015 |
|  |  |  |  |  |  |
| 54Y | \*111.75 | 333.35 | 5065.2 | 1078 | 1141 |
|  |  |  |  |  |  |
| 54Z | － | － | 5065.5 | 1078 | 1141 |
|  |  |  |  |  |  |
| 55X | 111.8 | － | － | 1079 | 1016 |
|  |  |  |  |  |  |
| 55Y | 111.85 | － | 5065.8 | 1079 | 1142 |
|  |  |  |  |  |  |
| 55Z | － | － | 5066.1 | 1079 | 1142 |
|  |  |  |  |  |  |
| 56X | \*111.90 | 331.1 | 5042.4 | 1080 | 1017 |
|  |  |  |  |  |  |
| 56W | － | － | 5042.7 | 1080 | 1017 |
|  |  |  |  |  |  |
| 56Y | \*111.95 | 330.95 | 5066.4 | 1080 | 1143 |
|  |  |  |  |  |  |
| 56Z | － | － | 5066.7 | 1080 | 1143 |
|  |  |  |  |  |  |
| 57X | 112 | － | － | 1081 | 1018 |
|  |  |  |  |  |  |
| 57Y | 112.05 | － | － | 1081 | 1144 |
|  |  |  |  |  |  |
| 58X | 112.1 | － | － | 1082 | 1019 |
|  |  |  |  |  |  |
| 58Y | 112.15 | － | － | 1082 | 1145 |
|  |  |  |  |  |  |
| 59X | 112.2 | － | － | 1083 | 1020 |
|  |  |  |  |  |  |
| 59Y | 112.25 | － | － | 1083 | 1146 |
|  |  |  |  |  |  |
| 60X | － | － | － | 1084 | 1021 |
|  |  |  |  |  |  |
| 60Y | － | － | － | 1084 | 1147 |
|  |  |  |  |  |  |
| 61X | － | － | － | 1085 | 1022 |
|  |  |  |  |  |  |
| 61Y | － | － | － | 1085 | 1148 |
|  |  |  |  |  |  |
| 62X | － | － | － | 1086 | 1023 |
|  |  |  |  |  |  |
| 62Y | － | － | － | 1086 | 1149 |
|  |  |  |  |  |  |
| 63X | － | － | － | 1087 | 1024 |
|  |  |  |  |  |  |
| 63Y | － | － | － | 1087 | 1150 |
|  |  |  |  |  |  |
| 64X | － | － | － | 1088 | 1151 |
|  |  |  |  |  |  |
| 64Y | － | － | － | 1088 | 1025 |
|  |  |  |  |  |  |
| 65X | － | － | － | 1089 | 1152 |
|  |  |  |  |  |  |
| 65Y | － | － | － | 1089 | 1026 |
|  |  |  |  |  |  |
| 66X | － | － | － | 1090 | 1153 |
|  |  |  |  |  |  |
| 66Y | － | － | － | 1090 | 1027 |
|  |  |  |  |  |  |
| 67X | － | － | － | 1091 | 1154 |
|  |  |  |  |  |  |
| 67Y | － | － | － | 1091 | 1028 |
|  |  |  |  |  |  |
| 68X | － | － | － | 1092 | 1155 |
|  |  |  |  |  |  |
| 68Y | － | － | － | 1092 | 1029 |
|  |  |  |  |  |  |
| 69X | － | － | － | 1093 | 1156 |
|  |  |  |  |  |  |
| 69Y | － | － | － | 1093 | 1030 |
|  |  |  |  |  |  |
| 70X | 112.3 | － | － | 1094 | 1157 |
|  |  |  |  |  |  |
| 70Y | 112.35 | － | － | 1094 | 1031 |
|  |  |  |  |  |  |
| 71X | 112.4 | － | － | 1095 | 1158 |
|  |  |  |  |  |  |
| 71Y | 112.45 | － | － | 1095 | 1032 |
|  |  |  |  |  |  |
| 72X | 112.5 | － | － | 1096 | 1159 |
|  |  |  |  |  |  |
| 72Y | 112.55 | － | － | 1096 | 1033 |
|  |  |  |  |  |  |
| 73X | 112.6 | － | － | 1097 | 1160 |
|  |  |  |  |  |  |
| 73Y | 112.65 | － | － | 1097 | 1034 |
|  |  |  |  |  |  |
| 74X | 112.7 | － | － | 1098 | 1161 |
|  |  |  |  |  |  |
| 74Y | 112.75 | － | － | 1098 | 1035 |
|  |  |  |  |  |  |
| 75X | 112.8 | － | － | 1099 | 1162 |
|  |  |  |  |  |  |
| 75Y | 112.85 | － | － | 1099 | 1036 |
|  |  |  |  |  |  |
| 76X | 112.9 | － | － | 1100 | 1163 |
|  |  |  |  |  |  |
| 76Y | 112.95 | － | － | 1100 | 1037 |
|  |  |  |  |  |  |
| 77X | 113 | － | － | 1101 | 1164 |
|  |  |  |  |  |  |
| 77Y | 113.05 | － | － | 1101 | 1038 |
|  |  |  |  |  |  |
| 78X | 113.1 | － | － | 1102 | 1165 |
|  |  |  |  |  |  |
| 78Y | 113.15 | － | － | 1102 | 1039 |
|  |  |  |  |  |  |
| 79X | 113.2 | － | － | 1103 | 1166 |
|  |  |  |  |  |  |
| 79Y | 113.25 | － | － | 1103 | 1040 |
|  |  |  |  |  |  |
| 80X | 113.3 | － | － | 1104 | 1167 |
|  |  |  |  |  |  |
| 80Y | 113.35 | － | 5067 | 1104 | 1041 |
|  |  |  |  |  |  |
| 80Z | － | － | 5067.3 | 1104 | 1041 |
|  |  |  |  |  |  |
| 81X | 113.4 | － | － | 1105 | 1168 |
|  |  |  |  |  |  |
| 81Y | 113.45 | － | 5067.6 | 1105 | 1042 |
|  |  |  |  |  |  |
| 81Z | － | － | 5067.9 | 1105 | 1042 |
|  |  |  |  |  |  |
| 82X | 113.5 | － | － | 1106 | 1169 |
|  |  |  |  |  |  |
| 82Y | 113.55 | － | 5068.2 | 1106 | 1043 |
|  |  |  |  |  |  |
| 82Z | － | － | 5068.5 | 1106 | 1043 |
|  |  |  |  |  |  |
| 83X | 113.6 | － | － | 1107 | 1170 |
|  |  |  |  |  |  |
| 83Y | 113.65 | － | 5068.8 | 1107 | 1044 |
|  |  |  |  |  |  |
| 83Z | － | － | 5069.1 | 1107 | 1044 |
|  |  |  |  |  |  |
| 84X | 113.7 | － | － | 1108 | 1171 |
|  |  |  |  |  |  |
| 84Y | 113.75 | － | 5069.4 | 1108 | 1045 |
|  |  |  |  |  |  |
| 84Z | － | － | 5069.7 | 1108 | 1045 |
|  |  |  |  |  |  |
| 85X | 113.8 | － | － | 1109 | 1172 |
|  |  |  |  |  |  |
| 85Y | 113.85 | － | 5070 | 1109 | 1046 |
|  |  |  |  |  |  |
| 85Z | － | － | 5070.3 | 1109 | 1046 |
|  |  |  |  |  |  |
| 86X | 113.9 | － | － | 1110 | 1173 |
|  |  |  |  |  |  |
| 86Y | 113.95 | － | 5070.6 | 1110 | 1047 |
|  |  |  |  |  |  |
| 86Z | － | － | 5070.9 | 1110 | 1047 |
|  |  |  |  |  |  |
| 87X | 114 | － | － | 1111 | 1174 |
|  |  |  |  |  |  |
| 87Y | 114.05 | － | 5071.2 | 1111 | 1048 |
|  |  |  |  |  |  |
| 87Z | － | － | 5071.5 | 1111 | 1048 |
|  |  |  |  |  |  |
| 88X | 114.1 | － | － | 1112 | 1175 |
|  |  |  |  |  |  |
| 88Y | 114.15 | － | 5071.8 | 1112 | 1049 |
|  |  |  |  |  |  |
| 88Z | － | － | 5072.1 | 1112 | 1049 |
|  |  |  |  |  |  |
| 89X | 114.2 | － | － | 1113 | 1176 |
|  |  |  |  |  |  |
| 89Y | 114.25 | － | 5072.4 | 1113 | 1050 |
|  |  |  |  |  |  |
| 89Z | － | － | 5072.7 | 1113 | 1050 |
|  |  |  |  |  |  |
| 90X | 114.3 | － | － | 1114 | 1177 |
|  |  |  |  |  |  |
| 90Y | 114.35 | － | 5073 | 1114 | 1051 |
|  |  |  |  |  |  |
| 90Z | － | － | 5073.3 | 1114 | 1051 |
|  |  |  |  |  |  |
| 91X | 114.4 | － | － | 1115 | 1178 |
|  |  |  |  |  |  |
| 91Y | 114.45 | － | 5073.6 | 1115 | 1052 |
|  |  |  |  |  |  |
| 91Z | － | － | 5073.9 | 1115 | 1052 |
|  |  |  |  |  |  |
| 92X | 114.5 | － | － | 1116 | 1179 |
|  |  |  |  |  |  |
| 92Y | 114.55 | － | 5074.2 | 1116 | 1053 |
|  |  |  |  |  |  |
| 92Z | － | － | 5074.5 | 1116 | 1053 |
|  |  |  |  |  |  |
| 93X | 114.6 | － | － | 1117 | 1180 |
|  |  |  |  |  |  |
| 93Y | 114.65 | － | 5074.8 | 1117 | 1054 |
|  |  |  |  |  |  |
| 93Z | － | － | 5075.1 | 1117 | 1054 |
|  |  |  |  |  |  |
| 94X | 114.7 | － | － | 1118 | 1181 |
|  |  |  |  |  |  |
| 94Y | 114.75 | － | 5075.4 | 1118 | 1055 |
|  |  |  |  |  |  |
| 94Z | － | － | 5075.7 | 1118 | 1055 |
|  |  |  |  |  |  |
| 95X | 114.8 | － | － | 1119 | 1182 |
|  |  |  |  |  |  |
| 95Y | 114.85 | － | 5076 | 1119 | 1056 |
|  |  |  |  |  |  |
| 95Z | － | － | 5076.3 | 1119 | 1056 |
|  |  |  |  |  |  |
| 96X | 114.9 | － | － | 1120 | 1183 |
|  |  |  |  |  |  |
| 96Y | 114.95 | － | 5076.6 | 1120 | 1057 |
|  |  |  |  |  |  |
| 96Z | － | － | 5076.9 | 1120 | 1057 |
|  |  |  |  |  |  |
| 97X | 115 | － | － | 1121 | 1184 |
|  |  |  |  |  |  |
| 97Y | 115.05 | － | 5077.2 | 1121 | 1058 |
|  |  |  |  |  |  |
| 97Z | － | － | 5077.5 | 1121 | 1058 |
|  |  |  |  |  |  |
| 98X | 115.1 | － | － | 1122 | 1185 |
|  |  |  |  |  |  |
| 98Y | 115.15 | － | 5077.8 | 1122 | 1059 |
|  |  |  |  |  |  |
| 98Z | － | － | 5078.1 | 1122 | 1059 |
|  |  |  |  |  |  |
| 99X | 115.2 | － | － | 1123 | 1186 |
|  |  |  |  |  |  |
| 99Y | 115.25 | － | 5078.4 | 1123 | 1060 |
|  |  |  |  |  |  |
| 99Z | － | － | 5078.7 | 1123 | 1060 |
|  |  |  |  |  |  |
| 100X | 115.3 | － | － | 1124 | 1187 |
|  |  |  |  |  |  |
| 100Y | 115.35 | － | 5079 | 1124 | 1061 |
|  |  |  |  |  |  |
| 100Z | － | － | 5079.3 | 1124 | 1061 |
|  |  |  |  |  |  |
| 101X | 115.4 | － | － | 1125 | 1188 |
|  |  |  |  |  |  |
| 101Y | 115.45 | － | 5079.6 | 1125 | 1062 |
|  |  |  |  |  |  |
| 101Z | － | － | 5079.9 | 1125 | 1062 |
|  |  |  |  |  |  |
| 102X | 115.5 | － | － | 1126 | 1189 |
|  |  |  |  |  |  |
| 102Y | 115.55 | － | 5080.2 | 1126 | 1063 |
|  |  |  |  |  |  |
| 102Z | － | － | 5080.5 | 1126 | 1063 |
|  |  |  |  |  |  |
| 103X | 115.6 | － | － | 1127 | 1190 |
|  |  |  |  |  |  |
| 103Y | 115.65 | － | 5080.8 | 1127 | 1064 |
|  |  |  |  |  |  |
| 103Z | － | － | 5081.1 | 1127 | 1064 |
|  |  |  |  |  |  |
| 104X | 115.7 | － | － | 1128 | 1191 |
|  |  |  |  |  |  |
| 104Y | 115.75 | － | 5081.4 | 1128 | 1065 |
|  |  |  |  |  |  |
| 104Z | － | － | 5081.7 | 1128 | 1065 |
|  |  |  |  |  |  |
| 105X | 115.8 | － | － | 1129 | 1192 |
|  |  |  |  |  |  |
| 105Y | 115.85 | － | 5082 | 1129 | 1066 |
|  |  |  |  |  |  |
| 105Z | － | － | 5082.3 | 1129 | 1066 |
|  |  |  |  |  |  |
| 106X | 115.9 | － | － | 1130 | 1193 |
|  |  |  |  |  |  |
| 106Y | 115.95 | － | 5082.6 | 1130 | 1067 |
|  |  |  |  |  |  |
| 106Z | － | － | 5082.9 | 1130 | 1067 |
|  |  |  |  |  |  |
| 107X | 116 | － | － | 1131 | 1194 |
|  |  |  |  |  |  |
| 107Y | 116.05 | － | 5083.2 | 1131 | 1068 |
|  |  |  |  |  |  |
| 107Z | － | － | 5083.5 | 1131 | 1068 |
|  |  |  |  |  |  |
| 108X | 116.1 | － | － | 1132 | 1195 |
|  |  |  |  |  |  |
| 108Y | 116.15 | － | 5083.8 | 1132 | 1069 |
|  |  |  |  |  |  |
| 108Z | － | － | 5084.1 | 1132 | 1069 |
|  |  |  |  |  |  |
| 109X | 116.2 | － | － | 1133 | 1196 |
|  |  |  |  |  |  |
| 109Y | 116.25 | － | 5084.4 | 1133 | 1070 |
|  |  |  |  |  |  |
| 109Z | － | － | 5084.7 | 1133 | 1070 |
|  |  |  |  |  |  |
| 110X | 116.3 | － | － | 1134 | 1197 |
|  |  |  |  |  |  |
| 110Y | 116.35 | － | 5085 | 1134 | 1071 |
|  |  |  |  |  |  |
| 110Z | － | － | 5085.3 | 1134 | 1071 |
|  |  |  |  |  |  |
| 111X | 116.4 | － | － | 1135 | 1198 |
|  |  |  |  |  |  |
| 111Y | 116.45 | － | 5085.6 | 1135 | 1072 |
|  |  |  |  |  |  |
| 111Z | － | － | 5085.9 | 1135 | 1072 |
|  |  |  |  |  |  |
| 112X | 116.5 | － | － | 1136 | 1199 |
|  |  |  |  |  |  |
| 112Y | 116.55 | － | 5086.2 | 1136 | 1073 |
|  |  |  |  |  |  |
| 112Z | － | － | 5086.5 | 1136 | 1073 |
|  |  |  |  |  |  |
| 113X | 116.6 | － | － | 1137 | 1200 |
|  |  |  |  |  |  |
| 113Y | 116.65 | － | 5086.8 | 1137 | 1074 |
|  |  |  |  |  |  |
| 113Z | － | － | 5087.1 | 1137 | 1074 |
|  |  |  |  |  |  |
| 114X | 116.7 | － | － | 1138 | 1201 |
|  |  |  |  |  |  |
| 114Y | 116.75 | － | 5087.4 | 1138 | 1075 |
|  |  |  |  |  |  |
| 114Z | － | － | 5087.7 | 1138 | 1075 |
|  |  |  |  |  |  |
| 115X | 116.8 | － | － | 1139 | 1202 |
|  |  |  |  |  |  |
| 115Y | 116.85 | － | 5088 | 1139 | 1076 |
|  |  |  |  |  |  |
| 115Z | － | － | 5088.3 | 1139 | 1076 |
|  |  |  |  |  |  |
| 116X | 116.9 | － | － | 1140 | 1203 |
|  |  |  |  |  |  |
| 116Y | 116.95 | － | 5088.6 | 1140 | 1077 |
|  |  |  |  |  |  |
| 116Z | － | － | 5088.9 | 1140 | 1077 |
|  |  |  |  |  |  |
| 117X | 117 | － | － | 1141 | 1204 |
|  |  |  |  |  |  |
| 117Y | 117.05 | － | 5089.2 | 1141 | 1078 |
|  |  |  |  |  |  |
| 117Z | － | － | 5089.5 | 1141 | 1078 |
|  |  |  |  |  |  |
| 118X | 117.1 | － | － | 1142 | 1205 |
|  |  |  |  |  |  |
| 118Y | 117.15 | － | 5089.8 | 1142 | 1079 |
|  |  |  |  |  |  |
| 118Z | － | － | 5090.1 | 1142 | 1079 |
|  |  |  |  |  |  |
| 119X | 117.2 | － | － | 1143 | 1206 |
|  |  |  |  |  |  |
| 119Y | 117.25 | － | 5090.4 | 1143 | 1080 |
|  |  |  |  |  |  |
| 119Z | － | － | 5090.7 | 1143 | 1080 |
|  |  |  |  |  |  |
| 120X | 117.3 | － | － | 1144 | 1207 |
|  |  |  |  |  |  |
| 120Y | 117.35 | － | － | 1144 | 1081 |
|  |  |  |  |  |  |
| 121X | 117.4 | － | － | 1145 | 1208 |
|  |  |  |  |  |  |
| 121Y | 117.45 | － | － | 1145 | 1082 |
|  |  |  |  |  |  |
| 122X | 117.5 | － | － | 1146 | 1209 |
|  |  |  |  |  |  |
| 122Y | 117.55 | － | － | 1146 | 1083 |
|  |  |  |  |  |  |
| 123X | 117.6 | － | － | 1147 | 1210 |
|  |  |  |  |  |  |
| 123Y | 117.65 | － | － | 1147 | 1084 |
|  |  |  |  |  |  |
| 124X | 117.7 | － | － | 1148 | 1211 |
|  |  |  |  |  |  |
| 124Y | 117.75 | － | － | 1148 | 1085 |
|  |  |  |  |  |  |
| 125X | 117.8 | － | － | 1149 | 1212 |
|  |  |  |  |  |  |
| 125Y | 117.85 | － | － | 1149 | 1086 |
|  |  |  |  |  |  |
| 126X | 117.9 | － | － | 1150 | 1213 |
|  |  |  |  |  |  |
| 126Y | 117.95 | － | － | 1150 | 1087 |
| \*The frequencies are limited to the radio stations use ILS Localizer.  2.The frequency for the radio station use ILS marker beacon: 75MHz  3.The frequency for the radio stations of ATCRBS:  (1)The radio stations on the surface of the earth: 1030 MHz, 1090 MHz  (2)The radio stations other than those on the surface of the earth: 1090 MHz  4. The frequency for the radio station uses ACAS: 1030 MHz | | | | | |

**Viet Nam**

a) Frequency band:108-117.975MHz

Channel spacing: 50kHz

**Fn=108 + (n-1) x 0.05**

b) Frequency band: 328.6 – 335.4 MHz

Channel spacing: 150kHz

**Fn=329.15 + (n-1) x 0.15**

c) Frequency band: 960 – 1 215 MHz

Channel spacing: 1MHz

**Fn=962 + (n-1)**

The band is divided into 126 channels for interrogation and 126 channels for reply, from centre frequency 962MHz to 1213MHz. The interrogation and reply frequencies always differ by 63 MHz.

According to Viet Namese standard TCCS 05:2009/CHK, Pursuant to Deputy of The Civil Aviation Authority’s Decision No1638/QĐ-CHK date 13/05/2009

Frequencies used by VOR, Localizer, Glide slope and DME stations working in the 108 – 117.975 MHz, 328.6 – 335.4 MHz and 960 – 1164 MHz frequency bands shall be grouped as describe in table below:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **VHF/UHF Plan for Aeronautical Radionavigation** | | | | | | | |
|  | | **DME / TACAN** | | | | **ILS** | |
| **Air (1025-1150MHz)** | | **Ground (962-1213MHz)** | |
| **TACAN Channel** | **VOR MHz** | **Interrogate MHz** | **Pulse Code usec** | **Reply MHz** | **Pulse Code usec** | **Localizer MHz** | **Glide Slope MHz** |
| 1X |  | 1025 | 12 | **962** | 12 |  |  |
| 1Y |  | 1025 | 36 | **1088** | 30 |  |  |
| 2X |  | 1026 | 12 | **963** | 12 |  |  |
| 2Y |  | 1026 | 36 | **1089** | 30 |  |  |
| 3X |  | 1027 | 12 | **964** | 12 |  |  |
| 3Y |  | 1027 | 36 | **1090** | 30 |  |  |
| 4X |  | 1028 | 12 | **965** | 12 |  |  |
| 4Y |  | 1028 | 36 | **1091** | 30 |  |  |
| 5X |  | 1029 | 12 | **966** | 12 |  |  |
| 5Y |  | 1029 | 36 | **1092** | 30 |  |  |
| 6X |  | 1030 | 12 | **967** | 12 |  |  |
| 6Y |  | 1030 | 36 | **1093** | 30 |  |  |
| 7X |  | 1031 | 12 | **968** | 12 |  |  |
| 7Y |  | 1031 | 36 | **1094** | 30 |  |  |
| 8X |  | 1032 | 12 | **969** | 12 |  |  |
| 8Y |  | 1032 | 36 | **1095** | 30 |  |  |
| 9X |  | 1033 | 12 | **970** | 12 |  |  |
| 9Y |  | 1033 | 36 | **1096** | 30 |  |  |
| 10X |  | 1034 | 12 | **971** | 12 |  |  |
| 10Y |  | 1034 | 36 | **1097** | 30 |  |  |
| 11X |  | 1035 | 12 | **972** | 12 |  |  |
| 11Y |  | 1035 | 36 | **1098** | 30 |  |  |
| 12X |  | 1036 | 12 | **973** | 12 |  |  |
| 12Y |  | 1036 | 36 | **1099** | 30 |  |  |
| 13X |  | 1037 | 12 | **974** | 12 |  |  |
| 13Y |  | 1037 | 36 | **1100** | 30 |  |  |
| 14X |  | 1038 | 12 | **975** | 12 |  |  |
| 14Y |  | 1038 | 36 | **1101** | 30 |  |  |
| 15X |  | 1039 | 12 | **976** | 12 |  |  |
| 15Y |  | 1039 | 36 | **1102** | 30 |  |  |
| 16X |  | 1040 | 12 | **977** | 12 |  |  |
| 16Y |  | 1040 | 36 | **1103** | 30 |  |  |
| 17X | 108 | 1041 | 12 | **978** | 12 |  |  |
| 17Y | 108.05 | 1041 | 36 | **1104** | 30 |  |  |
| 18X |  | 1042 | 12 | **979** | 12 | 108.1 | 334.7 |
| 18Y |  | 1042 | 36 | **1105** | 30 | 108.15 | 334.55 |
| 19X | 108.2 | 1043 | 12 | **980** | 12 |  |  |
| 19Y | 108.25 | 1043 | 36 | **1106** | 30 |  |  |
| 20X |  | 1044 | 12 | **981** | 12 | 108.3 | 334.1 |
| 20Y |  | 1044 | 36 | **1107** | 30 | 108.35 | 333.95 |
| 21X | 108.4 | 1045 | 12 | **982** | 12 |  |  |
| 21Y | 108.45 | 1045 | 36 | **1108** | 30 |  |  |
| 22X |  | 1046 | 12 | **983** | 12 | 108.5 | 329.9 |
| 22Y |  | 1046 | 36 | **1109** | 30 | 108.55 | 329.75 |
| 23X | 108.6 | 1047 | 12 | **984** | 12 |  |  |
| 23Y | 108.65 | 1047 | 36 | **1110** | 30 |  |  |
| 24X |  | 1048 | 12 | **985** | 12 | 108.7 | 330.5 |
| 24Y |  | 1048 | 36 | **1111** | 30 | 108.75 | 330.35 |
| 25X | 108.8 | 1049 | 12 | **986** | 12 |  |  |
| 25Y | 108.85 | 1049 | 36 | **1112** | 30 |  |  |
| 26X |  | 1050 | 12 | **987** | 12 | 108.9 | 329.3 |
| 26Y |  | 1050 | 36 | **1113** | 30 | 108.95 | 329.15 |
| 27X | 109 | 1051 | 12 | **988** | 12 |  |  |
| 27Y | 109.05 | 1051 | 36 | **1114** | 30 |  |  |
| 28X |  | 1052 | 12 | **989** | 12 | 109.1 | 331.4 |
| 28Y |  | 1052 | 36 | **1115** | 30 | 109.15 | 331.25 |
| 29X | 109.2 | 1053 | 12 | **990** | 12 |  |  |
| 29Y | 109.25 | 1053 | 36 | **1116** | 30 |  |  |
| 30X |  | 1054 | 12 | **991** | 12 | 109.3 | 332 |
| 30Y |  | 1054 | 36 | **1117** | 30 | 109.35 | 331.85 |
| 31X | 109.4 | 1055 | 12 | **992** | 12 |  |  |
| 31Y | 109.45 | 1055 | 36 | **1118** | 30 |  |  |
| 32X |  | 1056 | 12 | **993** | 12 | 109.5 | 332.6 |
| 32Y |  | 1056 | 36 | **1119** | 30 | 109.55 | 332.45 |
| 33X | 109.6 | 1057 | 12 | **994** | 12 |  |  |
| 33Y | 109.65 | 1057 | 36 | **1120** | 30 |  |  |
| 34X |  | 1058 | 12 | **995** | 12 | 109.7 | 333.2 |
| 34Y |  | 1058 | 36 | **1121** | 30 | 109.75 | 333.05 |
| 35X | 109.8 | 1059 | 12 | **996** | 12 |  |  |
| 35Y | 109.85 | 1059 | 36 | **1122** | 30 |  |  |
| 36X |  | 1060 | 12 | **997** | 12 | 109.9 | 333.8 |
| 36Y |  | 1060 | 36 | **1123** | 30 | 109.95 | 333.65 |
| 37X | 110 | 1061 | 12 | **998** | 12 |  |  |
| 37Y | 110.05 | 1061 | 36 | **1124** | 30 |  |  |
| 38X |  | 1062 | 12 | **999** | 12 | 110.1 | 334.4 |
| 38Y |  | 1062 | 36 | **1125** | 30 | 110.15 | 334.25 |
| 39X | 110.2 | 1063 | 12 | **1000** | 12 |  |  |
| 39Y | 110.25 | 1063 | 36 | **1126** | 30 |  |  |
| 40X |  | 1064 | 12 | **1001** | 12 | 110.3 | 335 |
| 40Y |  | 1064 | 36 | **1127** | 30 | 110.35 | 334.85 |
| 41X | 110.4 | 1065 | 12 | **1002** | 12 |  |  |
| 41Y | 110.45 | 1065 | 36 | **1128** | 30 |  |  |
| 42X |  | 1066 | 12 | **1003** | 12 | 110.5 | 329.6 |
| 42Y |  | 1066 | 36 | **1129** | 30 | 110.55 | 329.45 |
| 43X | 110.6 | 1067 | 12 | **1004** | 12 |  |  |
| 43Y | 110.65 | 1067 | 36 | **1130** | 30 |  |  |
| 44X |  | 1068 | 12 | **1005** | 12 | 110.7 | 330.2 |
| 44Y |  | 1068 | 36 | **1131** | 30 | 110.75 | 330.05 |
| 45X | 110.8 | 1069 | 12 | **1006** | 12 |  |  |
| 45Y | 110.85 | 1069 | 36 | **1132** | 30 |  |  |
| 46X |  | 1070 | 12 | **1007** | 12 | 110.9 | 330.8 |
| 46Y |  | 1070 | 36 | **1133** | 30 | 110.95 | 330.65 |
| 47X | 111 | 1071 | 12 | **1008** | 12 |  |  |
| 47Y | 111.05 | 1071 | 36 | **1134** | 30 |  |  |
| 48X |  | 1072 | 12 | **1009** | 12 | 111.1 | 331.7 |
| 48Y |  | 1072 | 36 | **1135** | 30 | 111.15 | 331.55 |
| 49X | 111.2 | 1073 | 12 | **1010** | 12 |  |  |
| 49Y | 111.25 | 1073 | 36 | **1136** | 30 |  |  |
| 50X |  | 1074 | 12 | **1011** | 12 | 111.3 | 332.3 |
| 50Y |  | 1074 | 36 | **1137** | 30 | 111.35 | 332.15 |
| 51X | 111.4 | 1075 | 12 | **1012** | 12 |  |  |
| 51Y | 111.45 | 1075 | 36 | **1138** | 30 |  |  |
| 52X |  | 1076 | 12 | **1013** | 12 | 111.5 | 332.9 |
| 52Y |  | 1076 | 36 | **1139** | 30 | 111.55 | 332.75 |
| 53X | 111.6 | 1077 | 12 | **1014** | 12 |  |  |
| 53Y | 111.65 | 1077 | 36 | **1140** | 30 |  |  |
| 54X |  | 1078 | 12 | **1015** | 12 | 111.7 | 333.5 |
| 54Y |  | 1078 | 36 | **1141** | 30 | 111.75 | 333.35 |
| 55X | 111.8 | 1079 | 12 | **1016** | 12 |  |  |
| 55Y | 111.85 | 1079 | 36 | **1142** | 30 |  |  |
| 56X |  | 1080 | 12 | **1017** | 12 | 111.9 | 331.1 |
| 56Y |  | 1080 | 36 | **1143** | 30 | 111.95 | 330.95 |
| 57Y | 112.05 | 1081 | 36 | **1144** | 30 |  |  |
| 58X | 112.1 | 1082 | 12 | **1019** | 12 |  |  |
| 58Y | 112.15 | 1082 | 36 | **1145** | 30 |  |  |
| 59X | 112.2 | 1083 | 12 | **1020** | 12 |  |  |
| 59Y | 112.25 | 1083 | 36 | **1146** | 30 |  |  |
| 60X |  | 1084 | 12 | **1021** | 12 |  |  |
| 60Y |  | 1084 | 36 | **1147** | 30 |  |  |
| 61X |  | 1085 | 12 | **1022** | 12 |  |  |
| 61Y |  | 1085 | 36 | **1148** | 30 |  |  |
| 62X |  | 1086 | 12 | **1023** | 12 |  |  |
| 62Y |  | 1086 | 36 | **1149** | 30 |  |  |
| 63X |  | 1087 | 12 | **1024** | 12 |  |  |
| 63Y |  | 1087 | 36 | **1150** | 30 |  |  |
| 64X |  | 1088 | 12 | **1151** | 12 |  |  |
| 64Y |  | 1088 | 36 | **1025** | 30 |  |  |
| 65X |  | 1089 | 12 | **1152** | 12 |  |  |
| 65Y |  | 1089 | 36 | **1026** | 30 |  |  |
| 66X |  | 1090 | 12 | **1153** | 12 |  |  |
| 66Y |  | 1090 | 36 | **1027** | 30 |  |  |
| 67X |  | 1091 | 12 | **1154** | 12 |  |  |
| 67Y |  | 1091 | 36 | **1028** | 30 |  |  |
| 68X |  | 1092 | 12 | **1155** | 12 |  |  |
| 68Y |  | 1092 | 36 | **1029** | 30 |  |  |
| 69X |  | 1093 | 12 | **1156** | 12 |  |  |
| 69Y |  | 1093 | 36 | **1030** | 30 |  |  |
| 70X | 112.3 | 1094 | 12 | **1157** | 12 |  |  |
| 70Y | 112.35 | 1094 | 36 | **1031** | 30 |  |  |
| 71X | 112.4 | 1095 | 12 | **1158** | 12 |  |  |
| 71Y | 112.45 | 1095 | 36 | **1032** | 30 |  |  |
| 72X | 112.5 | 1096 | 12 | **1159** | 12 |  |  |
| 72Y | 112.55 | 1096 | 36 | **1033** | 30 |  |  |
| 73X | 112.6 | 1097 | 12 | **1160** | 12 |  |  |
| 73Y | 112.65 | 1097 | 36 | **1034** | 30 |  |  |
| 74X | 112.7 | 1098 | 12 | **1161** | 12 |  |  |
| 74Y | 112.75 | 1098 | 36 | **1035** | 30 |  |  |
| 75X | 112.8 | 1099 | 12 | **1162** | 12 |  |  |
| 75Y | 112.85 | 1099 | 36 | **1036** | 30 |  |  |
| 76X | 112.9 | 1100 | 12 | **1163** | 12 |  |  |
| 76Y | 112.95 | 1100 | 36 | **1037** | 30 |  |  |
| 77X | 113 | 1101 | 12 | **1164** | 12 |  |  |
| 77Y | 113.05 | 1101 | 36 | **1038** | 30 |  |  |
| 78X | 113.1 | 1102 | 12 | **1165** | 12 |  |  |
| 78Y | 113.15 | 1102 | 36 | **1039** | 30 |  |  |
| 79X | 113.2 | 1103 | 12 | **1166** | 12 |  |  |
| 79Y | 113.25 | 1103 | 36 | **1040** | 30 |  |  |
| 80X | 113.3 | 1104 | 12 | **1167** | 12 |  |  |
| 80Y | 113.35 | 1104 | 36 | **1041** | 30 |  |  |
| 81X | 113.4 | 1105 | 12 | **1168** | 12 |  |  |
| 81Y | 113.45 | 1105 | 36 | **1041** | 30 |  |  |
| 82X | 113.5 | 1106 | 12 | **1169** | 12 |  |  |
| 82Y | 113.55 | 1106 | 36 | **1043** | 30 |  |  |
| 83X | 113.6 | 1107 | 12 | **1170** | 12 |  |  |
| 83Y | 113.65 | 1107 | 36 | **1044** | 30 |  |  |
| 84X | 113.7 | 1108 | 12 | **1171** | 12 |  |  |
| 84Y | 113.75 | 1108 | 36 | **1045** | 30 |  |  |
| 85X | 113.8 | 1109 | 12 | **1172** | 12 |  |  |
| 85Y | 113.85 | 1109 | 36 | **1046** | 30 |  |  |
| 86X | 113.9 | 1110 | 12 | **1173** | 12 |  |  |
| 86Y | 113.95 | 1110 | 36 | **1047** | 30 |  |  |
| 87X | 114 | 1111 | 12 | **1174** | 12 |  |  |
| 87Y | 114.05 | 1111 | 36 | **1048** | 30 |  |  |
| 88X | 114.1 | 1112 | 12 | **1175** | 12 |  |  |
| 88Y | 114.15 | 1112 | 36 | **1049** | 30 |  |  |
| 89X | 114.2 | 1113 | 12 | **1176** | 12 |  |  |
| 89Y | 114.25 | 1113 | 36 | **1050** | 30 |  |  |
| 90X | 114.3 | 1114 | 12 | **1177** | 12 |  |  |
| 90Y | 114.35 | 1114 | 36 | **1051** | 30 |  |  |
| 91X | 114.4 | 1115 | 12 | **1178** | 12 |  |  |
| 91Y | 114.45 | 1115 | 36 | **1052** | 30 |  |  |
| 92X | 114.5 | 1116 | 12 | **1179** | 12 |  |  |
| 92Y | 114.55 | 1116 | 36 | **1053** | 30 |  |  |
| 93X | 114.6 | 1117 | 12 | **1180** | 12 |  |  |
| 93Y | 114.65 | 1117 | 36 | **1054** | 30 |  |  |
| 94X | 114.7 | 1118 | 12 | **1181** | 12 |  |  |
| 94Y | 114.75 | 1118 | 36 | **1055** | 30 |  |  |
| 95X | 114.8 | 1119 | 12 | **1182** | 12 |  |  |
| 95Y | 114.85 | 1119 | 36 | **1056** | 30 |  |  |
| 96X | 114.9 | 1120 | 12 | **1183** | 12 |  |  |
| 96Y | 114.95 | 1120 | 36 | **1057** | 30 |  |  |
| 97X | 115 | 1121 | 12 | **1184** | 12 |  |  |
| 97Y | 115.05 | 1121 | 36 | **1058** | 30 |  |  |
| 98X | 115.1 | 1122 | 12 | **1185** | 12 |  |  |
| 98Y | 115.15 | 1122 | 36 | **1059** | 30 |  |  |
| 99X | 115.2 | 1123 | 12 | **1186** | 12 |  |  |
| 99Y | 115.25 | 1123 | 36 | **1060** | 30 |  |  |
| 100X | 115.3 | 1124 | 12 | **1187** | 12 |  |  |
| 100Y | 115.35 | 1124 | 36 | **1061** | 30 |  |  |
| 101X | 115.4 | 1125 | 12 | **1188** | 12 |  |  |
| 101Y | 115.45 | 1125 | 36 | **1062** | 30 |  |  |
| 102X | 115.5 | 1126 | 12 | **1189** | 12 |  |  |
| 102Y | 115.55 | 1126 | 36 | **1063** | 30 |  |  |
| 103X | 115.6 | 1127 | 12 | **1190** | 12 |  |  |
| 103Y | 115.65 | 1127 | 36 | **1064** | 30 |  |  |
| 104X | 115.7 | 1128 | 12 | **1191** | 12 |  |  |
| 104Y | 115.75 | 1128 | 36 | **1065** | 30 |  |  |
| 105X | 115.8 | 1129 | 12 | **1192** | 12 |  |  |
| 105Y | 115.85 | 1129 | 36 | **1066** | 30 |  |  |
| 106X | 115.9 | 1130 | 12 | **1193** | 12 |  |  |
| 106Y | 115.95 | 1130 | 36 | **1067** | 30 |  |  |
| 107X | 116 | 1131 | 12 | **1194** | 12 |  |  |
| 107Y | 116.05 | 1131 | 36 | **1068** | 30 |  |  |
| 108X | 116.1 | 1132 | 12 | **1195** | 12 |  |  |
| 108Y | 116.15 | 1132 | 36 | **1069** | 30 |  |  |
| 109X | 116.2 | 1133 | 12 | **1196** | 12 |  |  |
| 109Y | 116.25 | 1133 | 36 | **1070** | 30 |  |  |
| 110X | 116.3 | 1134 | 12 | **1197** | 12 |  |  |
| 110Y | 116.35 | 1134 | 36 | **1071** | 30 |  |  |
| 111X | 116.4 | 1135 | 12 | **1198** | 12 |  |  |
| 111Y | 116.45 | 1135 | 36 | **1072** | 30 |  |  |
| 112X | 116.5 | 1136 | 12 | **1199** | 12 |  |  |
| 112Y | 116.55 | 1136 | 36 | **1073** | 30 |  |  |
| 113X | 116.6 | 1137 | 12 | **1200** | 12 |  |  |
| 113Y | 116.65 | 1137 | 36 | **1074** | 30 |  |  |
| 114X | 116.7 | 1138 | 12 | **1201** | 12 |  |  |
| 114Y | 116.75 | 1138 | 36 | **1075** | 30 |  |  |
| 115X | 116.8 | 1139 | 12 | **1202** | 12 |  |  |
| 115Y | 116.85 | 1139 | 36 | **1076** | 30 |  |  |
| 116X | 116.9 | 1140 | 12 | **1203** | 12 |  |  |
| 116Y | 116.95 | 1140 | 36 | **1077** | 30 |  |  |
| 117X | 117 | 1141 | 12 | **1204** | 12 |  |  |
| 117Y | 117.05 | 1141 | 36 | **1078** | 30 |  |  |
| 118X | 117.1 | 1142 | 12 | **1205** | 12 |  |  |
| 118Y | 117.15 | 1142 | 36 | **1079** | 30 |  |  |
| 119X | 117.2 | 1143 | 12 | **1206** | 12 |  |  |
| 119Y | 117.25 | 1143 | 36 | **1080** | 30 |  |  |
| 120X | 117.3 | 1144 | 12 | **1207** | 12 |  |  |
| 120Y | 117.35 | 1144 | 36 | **1081** | 30 |  |  |
| 121X | 117.4 | 1145 | 12 | **1208** | 12 |  |  |
| 121Y | 117.45 | 1145 | 36 | **1082** | 30 |  |  |
| 122X | 117.5 | 1146 | 12 | **1209** | 12 |  |  |
| 122Y | 117.55 | 1146 | 36 | **1083** | 30 |  |  |
| 123X | 117.6 | 1147 | 12 | **1210** | 12 |  |  |
| 123Y | 117.65 | 1147 | 36 | **1084** | 30 |  |  |
| 124X | 117.7 | 1148 | 12 | **1211** | 12 |  |  |
| 124Y | 117.75 | 1148 | 36 | **1085** | 30 |  |  |
| 125X | 117.8 | 1149 | 12 | **1212** | 12 |  |  |
| 125Y | 117.85 | 1149 | 36 | **1086** | 30 |  |  |
| 126X | 117.9 | 1150 | 12 | **1213** | 12 |  |  |
| 126Y | 117.95 | 1150 | 36 | **1087** | 30 |  |  |