|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Survey control network** | | |  |  | |
| Reference point | | R1 | VHF Omnidirectional Radio | 300/360 | |
| Auxiliairy point | | R2 | Calibration platform | 301 | |
| Auxiliairy point | | R3 | Reference target | 302 | |
| Auxiliairy point | | R4 | Reference target | 303 | |
| Auxiliairy point | | R5 | Reference target | 304 | |
|  | |  | Reference target | 305 | |
| Aerodrome Reference Point | | 050 | DME antenna | 310/370 | |
| Highest point of the runway | | 151 |  |  | |
| **Helipads** |  | | Non-Direction Beacon | 320 | |
|  | | 051 | Tacan | 330 | |
|  | | 052 | Locator | 331 | |
|  | | 053 | VHF goniometer | 340 | |
|  | |  | UHF goniometer | 341 | |
| **Instruments calibration points / Holding points** | | |  |  | |
|  | 060 | | **Radio antennas** | |
|  | 061 | | ATIS information | 400 | |
|  | 062 | | APP approach | 405 | |
| Stand points / INS checkpoints | | |  | 406 | |
|  | | 500 |  | 407 | |
|  | | 501 |  | 408 | |
|  | | 502 |  | 409 | |
|  | | 503 | Control tower | 410 | |
|  | | 504 |  | 411 | |
|  | | 505 |  | 412 | |
| **Instrumental Flight Rule runway** | | |  | 413 | |
| Runway beginning / end | | 100 |  | 414 |
| Runway threshold | | 101 |  |  |
| Abeam Glide path runway / Drop down zone | | 102 | **Radars** |  |
| Abeam Glide path runway / Drop down zone | | 103 | GCA | 420 |
| Runway threshold | | 104 |  | 421 |
| Runway beginning / end | | 105 | PAR/SPAR | 430 |
| Runway beginning / end | | 110 | SRE | 440 |
| Runway threshold | | 111 |  | 441 |
| Abeam Glide path runway | | 112 | **Broadcast Stations** |  |
| Abeam Glide path runway | | 113 |  | 450 |
| Runway threshold | | 114 |  | 451 |
| Runway beginning / end | | 114 |  | 452 |
| **Visual Flight Rule runway** | | |  | 453 | |
| Runway begining / end | | 120 |  | 454 | |
| Runway end / begining | | 121 |  | 455 | |
| Runway begining / end | | 130 |  |  | |
| Runway end / begining | | 131 | Benchmarks | 700 | |
|  |  | | Trig points | 701 | |
| ILS\*\* Localizer antenna base | | 200/230 |  | 702 | |
| DGPS calibration platform | | 202/232 | **Obstructions** |  | |
| ILS Glide Path-antenna base | | 203/223 |  | 900 | |
| DGPS calibration platform | | 205/225 |  | 901 | |
| Longitudinal profile | | 214/234 |  | 902 | |
|  | | 215/235 |  | 903 | |
|  | | 216/236 |  | 904 | |
| Transverse profile | | 217/237 |  | 905 | |
|  | | 218/238 |  | 906 | |
| ILS DME Antenna | | 206/246 |  | 907 | |
| Inner Marker (IM) | | 207 |  | 908 | |
| Middle Marker (MM) | | 208 |  | 909 | |
| Outter Marker (OM) | | 209 |  | 910 | |

# FINAL COORDINATES

Coordinates of all points are referenced to the ITRF97 geodetic reference frame at epoch 2000.0 and are given in geographic coordinates (latitude, longitude and height above of the GRS80 ellipsoid).

Altitudes are defined in relation to the geoid. They were computed from ellipsoid heights using the EGM96 geoid model.

## 1- Reference point

The R1 reference point locally realises the ITRF97 geodetic frame.

The nominal accuracy (2 sigmas) of this point in ITRF97 is **20** centimetres in planimetry and **50** centimetres in height.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reference frame **ITRF97**  Ellipsoid  **GRS 80** | | | **Altitude**  **EGM96**  **(m)** |
| **Point number** | **Latitude**  **(sexagesimal degree)** | **Longitude**  **(sexagesimal degree)** | **Ellipsoid height**  **(m)** |
| R1/4 | 13°09'35.7472" N | 030°14'11.9865" E | 586.63 | 585.91 |

## 2- The survey control network

These points are materialized by concrete blocks and identified by R1 to R4 (see description sheets in appendix E). Coordinates of the R1 reference point are given above, coordinates of the others survey control stations are listed in the table below.

The position accuracy (2 sigmas) of these points relatively to the R1 reference point is 3 centimetres in planimetry and 5 centimetres in height.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reference frame **ITRF97**  Ellipsoid  **GRS 80** | | | **Altitude**  **EGM96**  **(m)** |
| **Point number** | **Latitude**  **(sexagesimal degree)** | **Longitude**  **(sexagesimal degree)** | **Ellipsoid height**  **(m)** |
| R2/4 | 13°08'51.3858" N | 030°14'03.7197" E | 585.37 | 584.66 |
| R3/4 | 13°08'21.4567" N | 030°13'44.1898" E | 587.34 | 586.63 |
| R4/4 | 13°09'29.5599" N | 030°13'51.8463" E | 580.29 | 579.55 |

## 3- The air navigation elements

The list below concerns the location of the :

* runway/stopway and apron points.
* navigation aids and broadcast stations.

The position accuracy (2 sigmas) of these points relatively to the survey control stations is :

* 3 centimetres in planimetry and 5 centimetres in height for ground points and navigation aids
* 30 centimetres in planimetry and 50 centimetres in height for the broadcast stations (radio and TV antennas) and the control tower.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reference frame **ITRF97**  Ellipsoid  **GRS 80** | | | **Altitude**  **EGM96**  **(m)** |
| **Point number** | **Latitude**  **(sexagesimal degree)** | **Longitude**  **(sexagesimal degree)** | **Ellipsoid height**  **(m)** |
| 050 | 13°09'10.4426" N | 030°13'57.7196" E | 583.50 | 582.78 |
| 060 | 13°09'29.2537" N | 030°14'03.5837" E | 581.59 | 580.86 |
| 061 | 13°09'29.3369" N | 030°14'02.9988" E | 581.58 | 580.85 |
| 062 | 13°09'34.4723" N | 030°14'03.7799" E | 581.28 | 580.55 |
| 100 | 13°08'23.0811" N | 030°13'50.6049" E | 587.93 | 587.22 |
| 101 | 13°08'23.2741" N | 030°13'50.6357" E | 587.91 | 587.20 |
| 102 | 13°08'36.6818" N | 030°13'52.6480" E | 586.62 | 585.91 |
| 103 | 13°09'46.2763" N | 030°14'03.0959" E | 580.25 | 579.52 |
| 104 | 13°09'59.4497" N | 030°14'05.0676" E | 579.45 | 578.72 |
| 105 | 13°09'59.6555" N | 030°14'05.0990" E | 579.47 | 578.74 |
| 151 | 13°08'23.0825" N | 030°13'50.5988" E | 587.93 | 587.22 |
| 300 | 13°08'51.6686" N | 030°14'00.3807" E | 590.50 | 589.79 |
| 310 | 13°08'51.6688" N | 030°14'00.3805" E | 591.75 | 591.03 |
| 320 | 13°09'24.2084" N | 030°14'19.7105" E | 620.86 | 620.14 |
| 410 | 13°09'28.259" N | 030°14'10.005" E | 594.2 | 593.5 |
| 450 | 13°11'01.345" N | 030°13'06.832" E | 658.6 | 657.8 |
| 500 | 13°09'31.7641" N | 030°14'09.3396" E | 581.57 | 580.85 |
| 501 | 13°09'30.1421" N | 030°14'09.0842" E | 581.97 | 581.24 |
| 502 | 13°09'28.5230" N | 030°14'08.8413" E | 582.12 | 581.40 |
| 503 | 13°09'26.9148" N | 030°14'08.5941" E | 582.19 | 581.47 |
| VOR New | 13d 06m 40.5sec | 030d 13m 35.3 sec | 587.839 | 587.109 |

## 4- The obstructions

Obstructions listed below are located in or in the vicinity of the airport, in the landing approach area.

The position accuracy (2 sigmas) of these points relatively to the survey control stations is :

* 30 centimetres in planimetry and 50 centimetres in height for points located on the aerodrome platform
* 3 metres in planimetry and 5 metres in height for points outside the aerodrome.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Reference frame **ITRF97**  Ellipsoid  **GRS 80** | | | | **Altitude**  **EGM96**  **(m)** |
| **Nature** | **Station number** | **Latitude**  **(sexagesimal degrees)** | **Longitude**  **(sexagesimal degrees)** | **Ellipsoid height**  **(m)** |
| NDB | 900 | 13°09'24.208" N | 030°14'19.711" E | 620.9 | 620.1 |
| Broadcast station | 901 | 13°11'01.345" N | 030°13'06.832" E | 660.6 | 659.8 |
| Mosque | 902 | 13°11'17.584" N | 030°14'13.767" E | 608.9 | 608.1 |
| Mosque | 903 | 13°11'11.932" N | 030°14'26.109" E | 608.5 | 607.8 |
| Antenna on top of control tower | 904 | 13°09'28.165" N | 030°14'10.094" E | 596.1 | 595.4 |
| Building | 905 | 13°10'24.914" N | 030°14'20.301" E | 595.6 | 594.9 |
|  | 906 | 13d 10m 01.17565sec | 030d 14m 24.44401 sec | 580.709 |  |
|  | 907 | 13d 10m 39.05369sec | 030d 14m 20.16083 sec | 580.960 |  |
|  | 908 | 13d 11m 01.09901sec | 030d 14m 16.62910 sec | 587.659 |  |
|  | 909 | 13d 11m 02.33748sec | 030d 12m 33.50277 sec | 568.431 |  |
|  | 910 | 13d 12m 45.12736sec | 030d 16m 57.78562 sec | 557.423 |  |
|  | 911 | 13d 10m 35.64090sec | 030d 14m 54.01932 sec | 577.312 |  |
|  | 912 | 13d 11m 01.36268sec | 030d 13m 06.83266 sec | 572.017 |  |
|  | 913 | 13d 10m 00.29549sec | 030d 12m 00.96714 sec | 580.881 |  |
|  | 914 | 13d 09m 49.12123sec | 030d 12m 23.46933 sec | 576.852 |  |
|  | 915 | 13d 09m 30.62120sec | 030d 13m 34.93693 sec | 578.336 |  |
| Telecomunication Antenna  Extended V.H.F  Wind Sock | 916  917  918  919  920  921  922  923  924  925  926  927  928  929  930  931  932  933  934  935  936  937  938  939  940  941 | 13d 09m 49.11353sec  13d 09m 56.4sec  13d 10m 00.8sec  13d 10m 29.8sec  13d 10m 31.8sec  13d 10m 35.7sec  13d 10m 38.0sec  13d 11m 29.3sec  13d 11m 16.0sec  13d 11m 55.8sec  13d 11m 40.9sec  13d 11m 23.7sec  13d 11m 13.1sec  13d 11m 09.1sec  13d 11m 38.0sec  13d 11m 02.0sec  13d 11m 00.4sec  13d 10m 45.8sec  13d 11m 33.9sec  13d 09m 59.9sec  13d 10m 04.0sec  13d 09m 49.1sec  13d 09m 43.1sec  13d 09m 17.3sec  13d 10m 29.1sec  13d 09m 26.55sec  13d 09m 25.16sec  13d 09m 18.78sec | 030d 12m 23.57645 sec  30d 14m 34.1sec  30d 14m 24.3sec  30d 14m 54.1sec  30d 15m 04.2sec  30d 14m 54.3sec  30d 14m 56.3sec  30d 14m 50.2sec  30d 14m 45.2sec  30d 14m 23.3sec  30d 13m 48.1sec  30d 13m 46.8sec  30d 13m 25.4sec  30d 13m 28.8sec  30d 13m 16.5sec  30d 12m 33.3sec  30d 12m 18.2sec  30d 11m 58.2sec  30d 11m 44.4sec  30d 12m 01.5sec  30d 11m 53.0sec  30d 12m 23.9sec  30d 12m 31.1sec  30d 12m `12.5sec  30d 12m 14.5sec  30d 14m 09.59sec  30d 14m 18.05sec  30d 14m 02.98sec | 577.484 | 623.2  620.3  618.1  614.8  627.7  612.3  625.4  603.1  615.5  619.8  618.6  612.3  616.5  631.4  647.6  618.7  620.1  627.3  655.8  630.1  620.3  618.7  622.3  618.5  590.90  618.99  587.43 |
|  | Radar | 13d 09m 07.63252sec | 030d 14m 06.63252 sec | 584.584 |  |
|  | Radar | 13d 09m 08.30145sec | 030d 14m 06.80740 sec | 605.082 |  |

## 5- POLICE STATIONS AND HOSPITALS

|  |  |  |  |
| --- | --- | --- | --- |
|  | Reference frame **ITRF97**  Ellipsoid **GRS 80** | | |
| **Nature** | **Latitude**  **(sexagesimal degree)** | **Longitude**  **(sexagesimal degree)** |  |
| Grand Hospital | 13°11'06.0" N | 030°13'24.6" E |  |
| Police western Sector | 13°11'00.7" N | 030°12'21.6" E |  |
| Police Hospital | 13°10'15.7" N | 030°12'46.3" E |  |
| Kordofan Specialise Hospital | 13°10'53.0" N | 030°13'12.6" E |  |
| Police Inter mediate Sector | 13°11'00.8" N | 030°13'04.3" E |  |
| Police Northern Sector | 13°11'53.5" N | 030°12'57.3" E |  |
| Military Hospital | 13°10'35.8" N | 030°13'42.6" E |  |
| Police Eastern Sector | 13°11'16.3" N | 030°14'00.8" E |  |
|  |  |  |  |

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