|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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** | **Northing** | **Easting** | **Ellipsoid height**  **(m)** |
| R1/4 | 1456467.51 | 200428.19 | 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** | **Northing** | **Easting** | **Ellipsoid height**  **(m)** |
| R2/4 | 1455106.08 | 200164.07 | 585.37 | 584.66 |
| R3/4 | 1454192.20 | 199565.38 | 587.34 | 586.63 |
| R4/4 | 1456283.91 | 199819.17 | 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** | **Northing** | **Easting** | **Ellipsoid height**  **(m)** |
| 050 | 1455694.09 | 199989.70 | 583.50 | 582.78 |
| 060 | 1456270.61 | 200172.78 | 581.59 | 580.86 |
| 061 | 1456273.36 | 200180.45 | 581.58 | 580.85 |
| 062 | 1456431.02 | 200180.45 | 581.28 | 580.55 |
| 100 | 1454240.03 | 199759.27 | 587.93 | 587.22 |
| 101 | 1454245.95 | 199760.26 | 587.91 | 587.20 |
| 102 | 1454657.59 | 199825.44 | 586.62 | 585.91 |
| 103 | 1456794.23 | 200163.83 | 580.25 | 579.52 |
| 104 | 1457198.67 | 200227.71 | 579.45 | 578.72 |
| 105 | 1457204.99 | 200228.72 | 579.47 | 578.74 |
| 151 | 1454240.07 | 199759.08 | 587.93 | 587.22 |
| 300 | 1455115.88 | 200063.54 | 590.50 | 589.79 |
| 310 | 1455115.89 | 200063.54 | 591.75 | 591.03 |
| 320 | 1456110.12 | 200657.05 | 620.86 | 620.14 |
| 410 | 1456237.89 | 200365.95 | 594.2 | 593.5 |
| 450 | 1459121.41 | 198493.91 | 658.6 | 657.8 |
| 500 | 1456345.90 | 200347.08 | 581.57 | 580.85 |
| 501 | 1456292.10 | 200338.83 | 581.97 | 581.24 |
| 502 | 1456246.40 | 200330.97 | 582.12 | 581.40 |
| 503 | 1456197.02 | 200322.97 | 582.19 | 581.47 |
| VOR New | 1451090.61 | 199263.31 | 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** | **Northing** | **Easting** | **Ellipsoid height**  **(m)** |
| NDB | 900 | 1456110.11 | 200657.07 | 620.9 | 620.1 |
| Broadcast station | 901 | 1459121.44 | 198493.90 | 660.6 | 659.8 |
| Mosque | 902 | 1459598.50 | 200516.29 | 608.9 | 608.1 |
| Mosque | 903 | 1459420.61 | 200886.26 | 608.5 | 607.8 |
| Antenna on top of control tower | 904 | 1456234.97 | 200368.60 | 596.1 | 595.4 |
| Building | 905 | 1457976.68 | 200695.35 | 595.6 | 594.9 |
|  | 906 | 1457245.33 | 200812.18 | 580.709 |  |
|  | 907 | 1458411.54 | 200695.91 | 580.960 |  |
|  | 908 | 1459090.62 | 200596.95 | 587.659 |  |
|  | 909 | 1459163.08 | 197489.95 | 568.431 |  |
|  | 910 | 1462236.50 | 205487.48 | 557.423 |  |
|  | 911 | 1458295.39 | 201715.00 | 577.312 |  |
|  | 912 | 1459121.96 | 198493.92 | 572.017 |  |
|  | 913 | 1457266.09 | 196488.30 | 580.881 |  |
|  | 914 | 1456914.91 | 197162.58 | 576.852 |  |
|  | 915 | 1456322.17 | 199309.96 | 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 | 1456914.64  1457095.28  1457233.83  1458115.75  1458173.92  1458297.12  1458367.19  1459946.72  1459539.38  1460770.53  1460324.03  1459795.81  1459476.70  1459352.56  1460245.38  1459152.77  1459096.33  1458666.37  1460150.18  1457253.75  1457382.68  1456914.12  1456727.20  1455940.03  1458147.34  1456185.48  1456139.93  1455948.73 | 197165.80  201101.54  200807.71  201715.46  202020.48  201723.48  201784.52  201618.01  201462.87  200816.46  199750.82  199705.81  199057.39  199158.48  198797.70  197483.72  197028.04  196420.51  196021.20  196504.22  196249.48  197175.55  197390.47  196821.13  196905.96  200352.86  200607.34  200151.04 | 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 | 1455604.72 | 200257.35 | 584.584 |  |
|  | Radar | 1455625.23 | 200262.84 | 605.082 |  |

## 5- POLICE STATIONS AND HOSPITALS

|  |  |  |  |
| --- | --- | --- | --- |
|  | Reference frame **ITRF97**  Ellipsoid **GRS 80** | | |
| **Nature** | **Northing** | **Easting** |  |
| Grand Hospital | 1459258.63 | 199030.87 |  |
| Police western Sector | 1459116.71 | 197130.73 |  |
| Police Hospital | 1457724.62 | 197859.64 |  |
| Kordofan Specialise Hospital | 1458862.87 | 198664.86 |  |
| Police Inter mediate Sector | 1459105.50 | 198417.42 |  |
| Police Northern Sector | 1460728.45 | 198224.48 |  |
| Military Hospital | 1458323.95 | 199563.00 |  |
| Police Eastern Sector | 1459563.33 | 200125.14 |  |
|  |  |  |  |

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