

**EUROPEAN RADIOCOMMUNICATIONS COMMITTEE**

ERC Decision  
of 30 June 1997  
on management of the Schiever Plan  
for the Terrestrial Flight Telecommunications System

(ERC/DEC/(97)08)  
(with July 1999 update of Annex 2)



WITHDRAWN

## **EXPLANATORY MEMORANDUM**

### **1. INTRODUCTION**

The Terrestrial Flight Telecommunications System (TFTS) is the European implementation of the Aeronautical Public Correspondence (APC) service providing public telecommunications facilities between passengers on aircraft and users on the ground.

In 1992 the European Radiocommunications Committee (ERC) adopted an ERC Decision (ERC/DEC/(92)01) designating the frequency bands 1670-1675 MHz (ground to air) and 1800-1805 (air to ground) for TFTS. Footnote S5.381 of the Radio Regulations also allocates these bands to APC on a world-wide basis.

European administrations, airlines and telecommunications operators support TFTS as an important contribution to the development of a trans-European transport network through the provision of enhanced communications facilities for aircraft passengers. Co-ordination and management of the frequencies used for TFTS is essential to an efficient and successful service.

### **2. BACKGROUND**

A Project Team of the Frequency Management Working Group (WG FM) of the ERC under the chairmanship of Mr Schiever, who passed away before the work on the plan could be finalised, has developed a frequency plan, now known as the Schiever Plan to honour his engagement in developing this plan for TFTS. The WG FM and the ERC has appointed the European Radiocommunications Office as the plan management body. The Schiever Plan employs a cellular frequency pattern covering the whole of continental Europe. Services have been introduced and ground station infrastructure is now being deployed by administrations and telecommunications operators across Europe.

Co-ordination between administrations in introducing frequency assignments and in making any changes to the plan is essential, therefore the FMWG has also developed a set of procedures for implementing assignments and modifying the plan and which define the technical criteria upon which the plan is based.

### **3. REQUIREMENT FOR AN ERC DECISION**

The allocation or designation of a frequency band for its use by a service or system under specified conditions in CEPT member countries is laid down by law, regulation or administrative action. In the case of TFTS where frequency bands for the system have been designated in an earlier ERC Decision, the ERC recognises that for the Schiever Plan to be implemented successfully throughout Europe, administrations and operators require clear guidance on implementing the plan and on making changes to assignments in the plan, including the introduction of new assignments. Therefore the ERC believes that it is necessary to produce a plan management procedure together with a detailed frequency assignment plan which will be updated from time to time. A commitment by CEPT member countries to implement the ERC Decision will ensure the successful implementation of TFTS on time and on a European-wide basis.

**ERC Decision  
of 30 June 1997**

on management of the Schiever Plan  
for the Terrestrial Flight Telecommunications System

**(ERC/DEC/(97)08)**

The European Conference of Postal and Telecommunications Administrations,

*considering:*

- a) that the ERC has adopted the Decision ERC/DEC/(92)01 of 22 October 1992 on the frequency bands to be used for the co-ordinated introduction of the Terrestrial Flight Telecommunications System within the CEPT administrations;
- b) that CEPT has developed a European TFTS Frequency Assignment Plan ("the Schiever Plan") for the implementation of TFTS;
- c) that the Schiever Plan has been developed on the basis of planning criteria adopted by Working Group FM;
- d) that the Schiever Plan identifies En-Route and Intermediate ground stations;
- e) that a number of the En-Route and Intermediate ground stations listed in the Schiever Plan have already been implemented according to the Plan;
- f) that administrations may wish to implement Airport ground stations which operate with power levels lower than the En-Route and Intermediate stations and which are not addressed in the Schiever Plan;
- g) that procedures for the implementation and modification of the Plan have been developed by the CEPT;
- h) that the information held in the Plan may, from time to time, require updating as a result of the successful application of the Modifications Procedure;
- i) that the European Radiocommunications Office (ERO) has been designated as the Plan Management Body;
- j) that TFTS frequency planning software which includes an extended format database version of the Schiever Plan is available to all CEPT administrations,

## DECIDES

- 1) that implementation or modification of the Schiever Plan shall be carried out in accordance with the Implementation and Modification Procedure which is prescribed in Annex 1. Application of the Procedure shall be according to the technical criteria prescribed therein;
- 2) that the technical basis for the calculation of interference between ground stations shall be that given in Appendix A to Annex 1 for those administrations not wishing to use the software tool for planning TFTS ground stations;
- 3) that the functions of the Plan Management Body shall be those prescribed in Annex 1;
- 4) that the definitive version of the Schiever Plan shall be held and updated at regular intervals by the Plan Management Body. The current version of the Plan is in Annex 2;
- 5) that administrations shall only implement En-Route and Intermediate ground stations which are listed in the Schiever Plan;
- 6) that this Decision shall enter into force on 1 October 1997;
- 7) that CEPT Member Administrations shall communicate the national measures implementing this Decision to the ERC chairman and the ERO when the Decision is nationally implemented.

## Note:

Please check the ERO web site ( [www.ero.dk](http://www.ero.dk) ) under "Documentation / Implementation" for the up to date position on the implementation of this and other ERC Decisions.

**ANNEX 1****Implementation and Modification Procedure  
for the  
European TFTS Frequency Assignment Plan****1 General**

1.1 The European TFTS Frequency Assignment Plan (hereafter called the “Schiever Plan”) indicates for each Ground Station the following information:

- the name of the station and the country code
- the GSIC (Ground Station Identity Code)
- the geographical co-ordinates (latitude and longitude in degrees)
- the maximum antenna height (above mean sea level in metres)
- the maximum allowable radius of the service area (in kilometres)
- the frequency channel blocks assigned.

1.2 The criteria used to establish the Schiever Plan and subsequently agreed for use in any modification of the Schiever Plan are described in Appendix A.

**2 Management of the Plan**

2.1 The European Radiocommunications Office (ERO) in Copenhagen has been designated as the Plan Management Body. The Plan Management Body shall have the following functions:

- Maintenance of the Schiever Plan established by WGFM;
- Validate and record proposed modifications to the Schiever Plan in consultation with administrations;
- Notify via a circular letter all CEPT administrations of changes and additions proposed to the Schiever Plan by an administration;
- Make available to all CEPT administrations a copy of the TFTS planning tool software;
- Make available at regular intervals an up-to date copy of the Schiever Plan database.

**3 Procedures for the implementation of the Schiever Plan**

3.1 Six weeks before bringing into use stations indicated in the Schiever Plan the administrations concerned shall provide using the form in Appendix B the following information to the ERO:

- the type of Ground Station (En-Route or Intermediate)
- the name of the station and the country code
- the GSIC (Ground Station Identity Code) if known
- the date at which the station shall be brought into service
- the actual geographical co-ordinates (latitude and longitude in degrees)
- the effective radiated power (ERP) or the equivalent isotropic radiated power(EIRP)
- the height at the base of the antenna (in metres above mean sea level)
- the antenna height (in metres above ground)
- the antenna characteristics (omnidirectional or with azimuthal polar diagram if directional)
- the frequency channel blocks to be used
- any constraints on frequency use (e.g., channels which cannot be used due to other uses of the frequency spectrum).

3.2 ERO shall, via a circular letter, notify all administrations of the proposal.

#### **4 Procedure for the modification of the Schiever Plan**

4.1 The procedure for modifying an entry or adding a station to the Schiever Plan shall be as follows:

4.1.1 The notifying administration shall evaluate the impact of its proposal on the stations in operation and those stations already notified for implementation in the Schiever Plan on the basis of the criteria given in Appendix A;

4.1.2 The notifying administration shall notify to the ERO details of the modifications proposed, including all characteristics listed in §3.1, and the stations considered to be affected by the proposal using the form at Appendix B and supporting text if appropriate;

4.1.3 ERO shall, via a circular letter, notify all administrations of the proposal;

4.1.4 Each administration shall respond to the notifying administration, with a copy to ERO, within 6 weeks following the notification;

4.1.5 If an administration does not respond during this period the notifying Administration shall send a reminder with a request to respond within 4 weeks. An administration which has not responded by the end of the 4 week period shall be deemed to have given its consent;

4.1.6 If a co-ordination request is rejected, the reason for rejection has to be communicated to the notifying administration;

4.1.7 A report of all the comments received shall be prepared by the notifying administration including, if necessary, a new proposal and this report shall be presented to ERO who will notify all administrations in accordance with §4.1.3;

4.1.8 On completion of a successful co-ordination ERO shall modify the Schiever Plan accordingly;

4.1.9 If a station is withdrawn from the Schiever Plan the notifying administration shall inform ERO who will amend the Schiever Plan accordingly.

4.2 The Modifications Procedure must also be applied if the base of the antenna tower moves by four kilometres or more or the height of the antenna changes by more than ten metres. A change in height of ten metres equates to a change in ground station radius coverage equivalent to a maximum move of the antenna tower of four kilometres for all antenna heights exceeding twenty two metres above mean sea level.

#### **5 Extended Range Waiver**

5.1 The Schiever Plan is based on a maximum range for each En-Route Ground Station (ERGS) of 240 km, except for stations adjacent to sea water where the range can be extended to 350 km to maximise the overall coverage of TFTS.

5.2 An Extended Range Waiver is an exception to the Schiever Plan. It is intended to provide coverage in thin route areas such as in some parts of Eastern and Southern Europe, particularly in the early stages of development of a network where it would be uneconomic to build a more complete infrastructure. Stations to which frequencies have been assigned in accordance with the Schiever Plan shall have precedence over any station operating under an ERW.

5.3 An Extended Range Waiver, which permits a Ground Station to operate with extended range coverage for a temporary period of time, may be granted under the following conditions:

5.3.1 In exceptional circumstances an Extended Range Waiver (ERW) shall be granted permitting an ERGS to operate with extended range beyond 240 km but not exceeding 350 km and shall in all cases be considered to be a temporary measure. Exceptional circumstances include the need to provide seamless coverage in areas where traffic density is for the moment insufficient to justify implementing all stations in an area, or the failure of a station resulting in the need to provide temporary extended coverage of an area;

5.3.2 Before implementing an Extended Range Waiver, the procedures in §4.1 must be applied, but see also §5.3.3. In addition to the details required in §3.1 the notifying administration must indicate the expected time period for operation under the ERW;

5.3.3 In urgent situations such as the failure of a ground station the concerned administration may extend the range of operation of a ground station providing that analysis of the Plan using the criteria at Appendix A demonstrates that this extension is possible without causing interference to operational stations of other administrations. Administrations with stations listed in the Plan which could be affected shall be informed immediately, and their agreement sought to the ERW. The ERO shall be informed at the same time. Administrations shall endeavour to respond promptly to the request.

5.3.4 On successful completion of the procedures in §4.1 the station details shall be entered in the Schiever Plan by ERO with an appropriate remark to indicate that the station is operating under an ERW;

5.3.5 The ERW station shall be obliged to revert to normal range when neighbouring stations are introduced extending the overall coverage and reducing the need for extended range operation, or when, in the case of the earlier failure of another station which resulted in the ERW, that station resumes operation;

5.3.6 If, by the end of the period in §5.3.2, there is no request to maintain the ERW then the ERW shall be cancelled in the Schiever Plan. Prolongation of the period shall be subject to the agreement of all affected administrations.

## **6 Bringing Assignments Into Use**

6.1 It is the responsibility of an administration to authorise the date and time at which its assignments in the Schiever Plan may be brought into use. Due to the cellular nature of the frequency plan (i.e., requiring the handover of aircraft stations between ground stations) it is important that the operational implementation of new assignments or changes to existing operational assignments are made on a co-ordinated and synchronised basis involving all operational stations in the TFTS network.

6.2 Therefore the operational implementation of assignments shall be done in close co-operation between administrations (through the Plan Management Body) and operators (through the TFTS Forum).



**7 Other Arrangements**

7.1 The periods mentioned above may be extended by common consent.

7.2 The method for evaluating the consequences of any modification to the Schiever Plan described in the Annex will be reviewed by the CEPT at the request of any administration in the light of developments in the prediction methods and/or experience in the operation of the TFTS network in Europe.

7.3 Until new provisions are agreed the same planning principles and co-ordination procedures will be used for TFTS Intermediate Ground Stations.

WITHDRAWN

## Appendix A

### Technical basis for the calculation of interference between ground stations

The Schiever Plan is based on the following criteria:

- i. En-Route Ground Stations (ERGS) must be able to sustain communications with aircraft at altitudes between 4 500 and 13 000 metres within their coverage area defined by a maximum operational radius not exceeding 240 km. In special cases up to 350 km radius is allowed, for example to provide coverage over sea water.
- ii. Intermediate Ground Stations (IGS) will provide coverage to aircraft at altitudes below 4 500 metres. The operational radius of coverage from an IGS will not exceed 45 km.
- iii. A radio channel can be reused at 25 km beyond the radio horizon related to an aircraft flying at the maximum altitude (13 000 metres). This means that minimum co-channel reuse distance depending on cell range and the GS antenna height is between 760 and 1060 km.
- iv. The minimum distance between Ground Stations using adjacent channels is between 380 and 490 km.
- v. The 2×5 MHz frequency allocation is divided into 164 duplex channel pairs. Frequencies are assigned in blocks of four channels as shown below in Table 1.
- vi. Maximum e.i.r.p. of 49 dBm for ERGS and 39 dBm for IGS.
- vii. Aircraft receiver sensitivity is assumed to be -112 dBm.
- viii. For co site operation a minimum frequency separation of 60.6 kHz is assumed.
- ix. C/I protection ratios are 20 dB, -17 dB, and -29 dB for co-channel, first and second adjacent channels respectively.
- x. An effective earth radius factor of 1.25 is used.
- xi. All antennas are assumed to be omnidirectional.

**Table 1. Schiever Plan channel block arrangement**

| Block | Channel |     |     |     | Block | Channel |     |     |     |
|-------|---------|-----|-----|-----|-------|---------|-----|-----|-----|
| 1     | 1       | 3   | 5   | 7   | 2     | 2       | 4   | 6   | 8   |
| 3     | 9       | 11  | 13  | 15  | 4     | 10      | 12  | 14  | 16  |
| 5     | 17      | 19  | 21  | 23  | 6     | 18      | 20  | 22  | 24  |
| 7     | 25      | 27  | 29  | 31  | 8     | 26      | 28  | 30  | 32  |
| 9     | 33      | 35  | 37  | 39  | 10    | 34      | 36  | 38  | 40  |
| 11    | 41      | 43  | 45  | 47  | 12    | 42      | 44  | 46  | 48  |
| 13    | 49      | 51  | 53  | 55  | 14    | 50      | 52  | 54  | 56  |
| 15    | 57      | 59  | 61  | 63  | 16    | 58      | 60  | 62  | 64  |
| 17    | 65      | 67  | 69  | 71  | 18    | 66      | 68  | 70  | 72  |
| 19    | 73      | 75  | 77  | 79  | 20    | 74      | 76  | 78  | 80  |
| 21    | 81      | 83  | 85  | 87  | 22    | 82      | 84  | 86  | 88  |
| 23    | 89      | 91  | 93  | 95  | 24    | 90      | 92  | 94  | 96  |
| 25    | 97      | 99  | 101 | 103 | 26    | 98      | 100 | 102 | 104 |
| 27    | 105     | 107 | 109 | 111 | 28    | 106     | 108 | 110 | 112 |
| 29    | 113     | 115 | 117 | 119 | 30    | 114     | 116 | 118 | 120 |
| 31    | 121     | 123 | 125 | 127 | 32    | 122     | 124 | 126 | 128 |
| 33    | 129     | 131 | 133 | 135 | 34    | 130     | 132 | 134 | 136 |
| 35    | 137     | 139 | 141 | 143 | 36    | 138     | 140 | 142 | 144 |
| 37    | 145     | 147 | 149 | 151 | 38    | 146     | 148 | 150 | 152 |
| 39    | 153     | 155 | 157 | 159 | 40    | 154     | 156 | 158 | 160 |
| 41    | 161     | 163 |     |     | 42    | 162     | 164 |     |     |

### Channel Frequencies

The Terrestrial Flight Telecommunications System (TFTS) operates in the bands 1670-1675 MHz (ground to air) and 1800-1805 MHz (air to ground). Centre frequencies (in MHz) of individual channels are expressed by the following relationships:

$$\text{lower band (ground to air): } fn = 1670 + n/33 \text{ MHz}$$

$$\text{Upper band (air to ground) } fn' = fn + 130 \text{ MHz}$$

where  $n = 1, 2, 3, \dots, 164$

and where  $fn$  and  $fn'$  are centre frequencies of a radio channel in the lower and upper bands respectively.

**TFTS FREQUENCY PLAN: GROUNDSTATION NOTIFICATION**

**APPENDIX B**

Notification of (tick appropriate box):

|                                     |                          |
|-------------------------------------|--------------------------|
| Implementation of ground station    | <input type="checkbox"/> |
| Modification of ground station      | <input type="checkbox"/> |
| Extended range waiver               | <input type="checkbox"/> |
| Cancellation of channel assignments | <input type="checkbox"/> |
| Cancellation of ground station      | <input type="checkbox"/> |

Stations considered to be affected by proposed modification / ERW

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

(modified details marked by \*)

Key of Groundstation:

Longitude:

Altitude:

metres above mean sea level  
*in decimal degrees (e.g. 2.345) (minus for Westerly longitudes)*

Name of Groundstation

Latitude:

|   |                                       |   |  |
|---|---------------------------------------|---|--|
| Planned date of operation: <input type="text" value="3 3 3 3 3"/>   |                                       | Type of Antenna:  |  |
| Date switched on: <input type="text" value="3 3 3 3 3"/> switched off: <input type="text" value="3 3 3 3 3"/> |                                       | Description of Antenna:   |  |
| Responsible country:  |                                       | Height of Antenna: metres above ground  |  |
| Company:  |                                       | Azimuth of Antenna: in degrees or omnidirectional (tick box) <input type="checkbox"/> |  |
| Type of Groundstation: En Route <input type="checkbox"/>  | Intermediate <input type="checkbox"/> | Elevation of Antenna: degrees (0° for omnidirectional)                                |  |
| Comments:   |                                       | Transmitter Power: <input type="text" value=""/> dBm                                  |  |
|   |                                       | Cable Losses: <input type="text" value=""/> dB  |  |
|   |                                       | Range: <input type="text" value=""/> km   |  |

Demand for Blocks (number of blocks required)  |  |

| Block No. | Channel 1 | Channel 2 | Channel 3 | Channel 4 | Local Bans<br>Details of frequency channels which may not be used |
|-----------|-----------|-----------|-----------|-----------|---|
|           |           |           |           |           |   |
|           |           |           |           |           |   |
|           |           |           |           |           |   |
|           |           |           |           |           |   |

TFTS Ground-Station Plan

Annex 2

## **Schiever Channel Assignment Plan**

**Ground Station Sites and Channel Assignments  
as adopted by the Frequency Management Working Group  
(Odense, 3-7 February 1997)  
including subsequent modifications up to 30 July 1999**

| <b>Parameters</b>                   |  |
|-------------------------------------|--|
| <b>Co-site separation:</b> 60.6 kHz | <b>Guard separation – co-channel:</b> 20 dB    |
| <b>Fading margin:</b> 11 dB         | <b>Guard separation - 1st adjacent:</b> -17 dB |
| <b>Gain - AS Antenna:</b> 1 dB      | <b>Guard separation - 2nd adjacent:</b> -29 dB |
| <b>AS RX Sensitivity:</b> -112 dBm  | <b>Extra Protection (co-channel):</b> 0 km     |

TFTS Ground-Station Plan

| Country Code | GS Nr | GS Name       | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km)   | Request. blocks | Channel Block Numbers |    |    |     |
|--------------|-------|---------------|--------------------|---------------------|--------------------|-------------------|-------------------|-----------------|-----------------------|----|----|-----|
|              |       |               |                    |                     |                    |                   |                   |                 | 1                     | 2  | 3  | 4   |
| ALB          | 56    | Tirana        | 41.35              | 19.8                | 300                | 70                | 240               | 1               | 23                    |    |    |     |
| AUT          | 23    | Wien          | 48.249             | 16.248              | 515                | 106               | 240               | 1               | 18                    |    |    |     |
| AUT          | 76    | Gaisberg      | 47.806             | 13.113              | 1285               | 70                | 240               | 1               | 30                    |    |    |     |
| BEL          | 69    | Brussels      | 50.83              | 4.35                | 50                 | 70                | 240               | 2               | 32*                   | 40 |    |     |
| BUL          | 89    | Varna         | 43.248             | 27.94               | 305                | 20                | 350               | 1               | 36                    |    |    |     |
| BUL          | 112   | Sofia         | 42.619             | 23.262              | 1348               | 100               | 240               | 2               | 12                    | 14 |    |     |
| BUL          | 113   | V. Turnovo    | 43.101             | 25.691              | 412                | 20                | 240               | 1               | 17                    |    |    |     |
| BUL          | 114   | Kardzhaly     | 41.428             | 25.471              | 956                | 60                | 240               | 1               | 5                     |    |    |     |
| CYP          | 64    | Nikosia       | 34.86              | 33.38               | 259                | 70                | 350               | 1               | 36                    |    |    |     |
| CZE          | 77    | Praha         | 50.1               | 14.27               | 380                | 50                | 240               | 1               | 24                    |    |    |     |
| D            | 12    | Zernien       | 53.026             | 10.906              | 138                | 108               | 240               | 2               | 10*                   | 31 |    |     |
| D            | 15    | Hohe Wurzel   | 50.111             | 8.134               | 614                | 133               | 240               | 4               | 17                    | 19 | 21 | 23* |
| D            | 16    | Lugstein      | 50.748             | 13.748              | 896                | 75                | 348 <sup>9)</sup> | 2               | 2*                    | 34 |    |     |
| D            | 22    | Isen          | 48.172             | 12.091              | 638                | 78                | 240               | 2               | 12*                   | 14 |    |     |
| D            | 43    | Pomellen      | 53.33              | 14.33               | 106                | 70                | 240               | 2               | 20                    | 22 |    |     |
| D            | 200   | Kaltenkirchen | 53.830             | 9.920               | 50                 | 0                 | 45                | 1               | 6                     |    |    |     |
| D            | 201   | Luckenwalde   | 52.170             | 13.170              | 50                 | 0                 | 45                | 1               | 13                    |    |    |     |
| D            | 202   | Neuruppin     | 52.92              | 12.75               | 50                 | 0                 | 45                | 1               | 26                    |    |    |     |
| D            | 203   | Grefrath      | 51.330             | 6.380               | 50                 | 0                 | 45                | 1               | 29 <sup>4)</sup>      |    |    |     |
| D            | 204   | Zülpich       | 50.670             | 6.580               | 200                | 0                 | 45                | 1               | 29 <sup>5)</sup>      |    |    |     |
| D            | 205   | Meissen       | 51.170             | 13.420              | 300                | 0                 | 45                | 1               | 16                    |    |    |     |

TFTS Ground-Station Plan

| Country Code | GS Nr | GS Name                | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km) | Request. blocks | Channel Block Numbers |    |   |   |
|--------------|-------|------------------------|--------------------|---------------------|--------------------|-------------------|-----------------|-----------------|-----------------------|----|---|---|
|              |       |                        |                    |                     |                    |                   |                 |                 | 1                     | 2  | 3 | 4 |
| D            | 206   | Neustadt               | 52.500             | 9.500               | 100                | 0                 | 45              | 1               | 25                    |    |   |   |
| D            | 207   | Halle                  | 51.5               | 12.12               | 144                | 0                 | 45              | 1               | 27                    |    |   |   |
| D            | 208   | Freising / Moosbach    | 48.330             | 11.920              | 405                | 0                 | 45              | 1               | 3                     |    |   |   |
| D            | 209   | Seligenstadt           | 50.050             | 8.950               | 100                | 0                 | 45              | 1               | 39 <sup>6)</sup>      |    |   |   |
| D            | 210   | Worms                  | 49.67              | 8.280               | 100                | 0                 | 45              | 1               | 39 <sup>7)</sup>      |    |   |   |
| D            | 211   | Herzogenaurach         | 49.580             | 10.860              | 100                | 0                 | 45              | 1               | 26                    |    |   |   |
| D            | 212   | Tuebingen              | 48.580             | 9.080               | 150                | 0                 | 45              | 1               | 36                    |    |   |   |
| D            | 213   | Delmenhorst            | 53.080             | 8.670               | 50                 | 0                 | 45              | 1               | 16                    |    |   |   |
| DNK          | 8     | Blaavand               | 55.550             | 8.131               | 5                  | 20                | 350             | 2               | 28*                   | 38 |   |   |
| DNK          | 65    | Faeroes                | 62.05              | -7.25               | 200                | 70                | 350             | 2               | 20                    | 22 |   |   |
| E            | 18    | PicoTresMa/Cantabria   | 43.047             | -4.408              | 2175               | 70                | 280             | 1               | 5                     |    |   |   |
| E            | 25    | Bola de Mundo / Madrid | 40.784             | -3.985              | 2262               | 70                | 240             | 2               | 19                    | 21 |   |   |
| E            | 26    | Lorri o Rubio / Lerida | 42.408             | 1.201               | 2439               | 70                | 240             | 1               | 17                    |    |   |   |
| E            | 30    | Pinos genil / Granada  | 37.164             | -3.501              | 778                | 70                | 240             | 1               | 3                     |    |   |   |
| E            | 31    | Javalambre / Teruel    | 40.102             | -1.024              | 2002               | 70                | 240             | 2               | 29                    | 31 |   |   |
| E            | 32    | Alfabia / Mallorca     | 39.732             | 2.727               | 1034               | 70                | 300             | 2               | 4                     | 6  |   |   |
| E            | 84    | Montana la Gorra (Can) | 27.958             | -15.563             | 1949               | 0                 | 350             | 1               | 4                     |    |   |   |
| E            | 98    | Gibalbin (Cadiz)       | 36.833             | -5.955              | 386                | 30                | 45              | 1               | 18                    |    |   |   |
| E            | 99    | Algeciras (Cadiz)      | 36.147             | -5.46               | 101                | 30                | 45              | 1               | 22                    |    |   |   |
| E            | 100   | Mijas (Malaga)         | 36.607             | -4.596              | 958                | 30                | 45              | 1               | 20                    |    |   |   |
| E            | 101   | Altana (Alicante)      | 38.652             | -0.273              | 1520               | 30                | 45              | 1               | 18                    |    |   |   |

TFTS Ground-Station Plan

| Country Code | GS Nr | GS Name                    | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km) | Request. blocks  | Channel Block Numbers |     |    |     |
|--------------|-------|----------------------------|--------------------|---------------------|--------------------|-------------------|-----------------|------------------|-----------------------|-----|----|-----|
|              |       |                            |                    |                     |                    |                   |                 |                  | 1                     | 2   | 3  | 4   |
| E            | 102   | Alfabia (Balears)          | 39.732             | 2.727               | 1034               | 30                | 45              | 1                | 1                     |     |    |     |
| E            | 103   | M. la Gorra (Canarias)     | 27.958             | -15.563             | 1949               | 30                | 45              | 1                | 1                     |     |    |     |
| E            | 104   | Mont Blanch (Lerida)       | 41.376             | 1.165               | 353                | 30                | 45              | 1                | 37                    |     |    |     |
| E            | 105   | NS de los Angeles (GE)     | 41.979             | -2.911              | 500                | 30                | 45              | 1                | 27                    |     |    |     |
| E            | 106   | Orduna (Vizcaya)           | 42.950             | -3.026              | 920                | 30                | 45              | 1                | 32                    |     |    |     |
| E            | 107   | Monte Cima (Asturias)      | 43.435             | -5.590              | 733                | 30                | 45              | 1                | 18                    |     |    |     |
| E            | 108   | Valladolid-radio (VA)      | 41.629             | -4.678              | 844                | 30                | 45              | 1                | 37                    |     |    |     |
| E            | 109   | Miravete (Caceres)         | 39.717             | -5.767              | 839                | 30                | 45              | 1                | 1                     |     |    |     |
| E            | 110   | La Bola del Mundo          | 40.784             | -3.985              | 2262               | 30                | 45              | 1                | 13                    |     |    |     |
| F            | 13    | Nantes/Langon              | 47.711             | -1.899              | 57                 | 115               | 350             | 2                | 20                    | 22* |    |     |
| F            | 14    | Paris/Andilly              | 49.013             | 2.302               | 251                | 76.5              | 240             | 4                | 11                    | 13  | 15 | 37* |
| F            | 19    | Limog/La Porcherie         | 45.565             | 1.511               | 504                | 55                | 240             | 2                | 7                     | 30* |    |     |
| F            | 20    | Lyon/Cormaranche           | 45.955             | 5.629               | 1222               | 49                | 320             | 3 <sup>2</sup> * | 18                    | 25  | 27 |     |
| F            | 27    | Toulon / le Revest         | 43.184             | 5.907               | 785                | 40                | 350             | 2                | 10                    | 38* |    |     |
| F            | 42    | Bayonne/St. Martin de Hinx | 43.593             | -1.242              | 104                | 36                | 350             | 1                | 2*                    |     |    |     |
| F            | 97    | Paris-Champlan             | 48,714             | 2.281               | 96                 | 26.5              | 240             | 1                | 34*                   |     |    |     |
| FNL          | 5     | Keimola                    | 60.185             | 24.495              | 86                 | 48                | 240             | 1                | 8*                    |     |    |     |
| FNL          | 39    | Vaasa                      | 63.080             | 21.700              | 64                 | 70                | 270             | 1                | 33                    |     |    |     |
| FNL          | 44    | Kuopio                     | 62.91              | 27.66               | 309                | 70                | 300             | 1                | 1                     |     |    |     |
| FNL          | 45    | Rovaniemi                  | 66.51              | 25.68               | 250                | 70                | 300             | 1                | 31                    |     |    |     |
| G            | 1     | Kirk O' Shotts             | 55.850             | -3.820              | 288                | 21                | 350             | 1                | 4*                    |     |    |     |



TFTS Ground-Station Plan

| Country Code | GS Nr | GS Name            | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km) | Request. blocks | Channel Block Numbers |                    |    |    |
|--------------|-------|--------------------|--------------------|---------------------|--------------------|-------------------|-----------------|-----------------|-----------------------|--------------------|----|----|
|              |       |                    |                    |                     |                    |                   |                 |                 | 1                     | 2                  | 3  | 4  |
| G            | 7     | Anglesey           | 53.390             | -4.300              | 152                | 5                 | 348             | 2               | 14*                   | 16                 |    |    |
| G            | 10    | Heathrow           | 51.483             | -0.438              | 24                 | 20                | 240             | 1               | 9*                    |                    |    |    |
| G            | 41    | Cave Wold          | 53.783             | -0.557              | 156                | 6                 | 350             | 1               | 1*                    |                    |    |    |
| G            | 67    | Sumburgh           | 59.90              | -1.25               | 50                 | 70                | 350             | 2               | 9                     | 11                 |    |    |
| G            | 71    | Bournemouth        | 50.75              | -1.85               | 50                 | 50                | 240             | 1               | 31                    |                    |    |    |
| G            | 72    | Belfast            | 54.62              | -5.83               | 170                | 42                | 240             | 2               | 8                     | 10                 |    |    |
| G            | 116   | Tingley            | 53.73              | -1.580              | 130                | 50                | 350             | 1               | 2                     |                    |    |    |
| G            | 117   | Knockhill          | 56.120             | -3.520              | 360                | 35                | 350             | 1               | 37                    |                    |    |    |
| G            | 118   | Heathrow (2)       | 51.45              | -0.45               | 20                 | 25                | 240             | 2               | 24                    | 26                 |    |    |
| G            | 119   | Ealing             | 51.514             | -0.300              | 35                 | 37                | 240             | 1               | 3*                    |                    |    |    |
| GRC          | 57    | Parnitha           | 38.171             | 23.728              | 1345               | 35                | 350             | 2               | 7                     | 9                  |    |    |
| GRC          | 60    | Zakinthos          | 37.799             | 20.896              | 100                | 25                | 350             | 2               | 16                    | 18                 |    |    |
| GRC          | 61    | Astypalaia         | 36.581             | 26.411              | 190                | 25                | 350             | 2               | 35                    | 37                 |    |    |
| GRC          | 115   | Kouri              | 40.634             | 23.059              | 720                | 35                | 350             | 2               | 31                    | 33                 |    |    |
| HNG          | 51    | Budapest           | 47.469             | 19.128              | 118                | 155               | 240             | 1               | 21                    |                    |    |    |
| HOL          | 11    | Amsterdam/Schiphol | 52.337             | 4.888               | 30                 | 54                | 240             | 2               | 5                     | 35 <sup>1)</sup> * |    |    |
| HOL          | 111   | Amsterdam (2)      | 52.384             | 4.833               | 0                  | 23                | 240             | 2               | 7                     | 35 <sup>3)</sup>   |    |    |
| HRV          | 53    | Zagreb             | 45.9               | 15.95               | 1035               | 30                | 240             | 1               | 7                     | 9                  |    |    |
| HRV          | 54    | Split              | 43.583             | 16.217              | 700                | 30                | 240             | 2               | 13                    |                    |    |    |
| I            | 28    | Monte Beigua       | 44.433             | 8.565               | 1305               | 65                | 240             | 4*              | 16                    | 29                 | 31 | 33 |
| I            | 29    | Lugugnana          | 45.732             | 12.950              | 1                  | 80                | 260             | 4*              | 20                    | 22                 | 35 | 37 |

TFTS Ground-Station Plan

| Country Code | GS Nr | GS Name                | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km) | Request. blocks | Channel Block Numbers |     |    |    |
|--------------|-------|------------------------|--------------------|---------------------|--------------------|-------------------|-----------------|-----------------|-----------------------|-----|----|----|
|              |       |                        |                    |                     |                    |                   |                 |                 | 1                     | 2   | 3  | 4  |
| I            | 33    | Monte Lerno            | 40.606             | 9.166               | 1093               | 37                | 280             | 3*              | 5                     | 19  | 21 |    |
| I            | 34    | Maschio Faete          | 41.747             | 12.730              | 946                | 15                | 260             | 4*              | 15                    | 17  | 24 | 40 |
| I            | 35    | Monte Erice            | 38.035             | 12.582              | 700                | 38                | 280             | 3               | 30                    | 32  | 34 |    |
| I            | 36    | Monte Mancuso          | 39.008             | 16.218              | 1290               | 45                | 280             | 3               | 6                     | 8   | 10 |    |
| IRL          | 6     | Dublin                 | 53.350             | -6.340              | 206                | 70                | 350             | 2               | 19                    | 21  |    |    |
| IRL          | 73    | Shannon                | 52.72              | -8.96               | 100                | 70                | 350             | 2               | 25                    | 27  |    |    |
| ISL          | 66    | Reykjavik              | 64.00              | -19.75              | 1495               | 70                | 350             | 2               | 19                    | 21  |    |    |
| LTU          | 46    | Siauliai               | 55.56              | 23.18               | 180                | 100               | 240             | 1               | 21                    |     |    |    |
| LTU          | 48    | Vilnius                | 54.38              | 25.17               | 180                | 100               | 350             | 1               | 7                     |     |    |    |
| MLT          | 68    | Mtarfa                 | 35.896             | 14.401              | 768                | 70                | 350             | 1               | 20                    |     |    |    |
| NOR          | 2     | Rogaland Radio (Stav.) | 58.807             | 5.671               | 83                 | 22.5              | 350             | 2               | 13*                   | 19  |    |    |
| NOR          | 3     | Branfjell (Oslo)       | 59.888             | 10.793              | 290                | 190               | 280             | 4               | 30                    | 32  | 34 | 7* |
| NOR          | 37    | Molde                  | 62.895             | 7.114               | 696                | 78                | 350             | 2               | 1                     | 21* |    |    |
| NOR          | 74    | Junkerfjell (Bodo)     | 67.27              | 14.37               | 50                 | 70                | 350             | 2               | 5*                    | 8   |    |    |
| NOR          | 75    | Lakselv                | 69.97              | 23.37               | 50                 | 70                | 350             | 1               | 21                    |     |    |    |
| POL          | 47    | Kielce                 | 50.874             | 20.635              | 266                | 20                | 240             | 1               | 19                    |     |    |    |
| POL          | 49    | Mlawa                  | 53.095             | 20.42               | 181                | 86                | 350             | 1               | 32                    |     |    |    |
| POL          | 70    | Czarnkow               | 52.902             | 16.593              | 102                | 20                | 240             | 1               | 29                    |     |    |    |
| POR          | 17    | Serra de Arga          | 41.800             | -8.680              | 794                | 70                | 350             | 1               | 30                    |     |    |    |
| POR          | 24    | Alcacovas              | 38.380             | -8.180              | 239                | 70                | 350             | 1               | 6                     |     |    |    |
| ROU          | 52    | Dej                    | 47.13              | 23.8                | 300                | 70                | 240             | 1               | 8                     |     |    |    |

TFTS Ground-Station Plan

| Country Code | GS Nr | GS Name       | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km) | Request. blocks | Channel Block Numbers |                 |   |   |
|--------------|-------|---------------|--------------------|---------------------|--------------------|-------------------|-----------------|-----------------|-----------------------|-----------------|---|---|
|              |       |               |                    |                     |                    |                   |                 |                 | 1                     | 2               | 3 | 4 |
| ROU          | 55    | Bucharest     | 44.4               | 26.2                | 100                | 70                | 240             | 1               | 24                    |                 |   |   |
| S            | 4     | Stockholm     | 59.650             | 17.941              | 61                 | 30                | 240             | 2               | 2*                    | 23              |   |   |
| S            | 9     | Malmoe        | 55.582             | 12.924              | 47                 | 45                | 240             | 2               | 1                     | 3*              |   |   |
| S            | 38    | Ömsköldsv.    | 63.368             | 18.119              | 374                | 48                | 350             | 1               | 15*                   |                 |   |   |
| S            | 40    | Kalmar        | 56.684             | 16.169              | 37                 | 27                | 350             | 1               | 12*                   |                 |   |   |
| S            | 93    | Stockholm (2) | 59.333             | 18.017              | 43                 | 40                | 240             | 1               | 5                     |                 |   |   |
| S            | 94    | Malmoe (2)    | 55.6               | 13                  | 5                  | 35                | 240             | 1               | 8                     |                 |   |   |
| S            | 95    | Kalmar (2)    | 56.667             | 16.533              | 45                 | 48                | 240             | 1               | 18                    |                 |   |   |
| S            | 96    | Ratan (2)     | 63.833             | 20.317              | 69                 | 38                | 240             | 1               | 22                    |                 |   |   |
| SUI          | 21    | Albis         | 47.185             | 8.303               | 810                | 62                | 240             | 3               | 4*                    | 6               | 8 |   |
| SUI          | 85    | Niederhorn    | 47.424             | 7.463               | 1943               | 30                | 240             | 1               | 1                     |                 |   |   |
| SVK          | 50    | Presov        | 49.00              | 21.25               | 800                | 70                | 240             | 1               | 1                     |                 |   |   |
| SVN          | 120   | Ljubljana     | 45.929             | 14.475              | 1098               | 30                | 240             | 2               | 1                     | 3 <sup>8)</sup> |   |   |
| TUR          | 58    | Istanbul      | 40.967             | 28.833              | 50                 | 25                | 240             | 1               | 15                    |                 |   |   |
| TUR          | 59    | Samsun        | 41.267             | 36.300              | 50                 | 25                | 240             | 1               | 13                    |                 |   |   |
| TUR          | 63    | Finike        | 36.267             | 30.150              | 50                 | 70                | 240             | 1               | 17                    |                 |   |   |
| TUR          | 78    | Ankara        | 39.917             | 32.667              | 848                | 25                | 240             | 1               | 18                    |                 |   |   |
| TUR          | 79    | Adana         | 36.933             | 35.2                | 50                 | 25                | 240             | 1               | 14                    |                 |   |   |
| TUR          | 80    | Agri          | 39.733             | 43.3                | 1640               | 25                | 240             | 1               | 15                    |                 |   |   |
| TUR          | 81    | Trabzon       | 41.0               | 39.75               | 50                 | 25                | 240             | 1               | 35                    |                 |   |   |
| TUR          | 82    | Diyarbakir    | 37.867             | 40.2                | 660                | 25                | 240             | 1               | 17                    |                 |   |   |

**TFTS Ground-Station Plan**

| Country Code | GS Nr | GS Name | Latitude (dec deg) | Longitude (dec deg) | GS height (m-amsl) | Ae. height (m-ag) | Cell Range (km) | Request. blocks | Channel Block Numbers |   |   |   |
|--------------|-------|---------|--------------------|---------------------|--------------------|-------------------|-----------------|-----------------|-----------------------|---|---|---|
|              |       |         |                    |                     |                    |                   |                 |                 | 1                     | 2 | 3 | 4 |
| TUR          | 83    | Izmir   | 38.25              | 27.167              | 50                 | 25                | 240             | 1               | 13                    |   |   |   |

WITHDRAWN

### TFTS Ground-Station Plan

---

\* Operational Station.

- <sup>1)</sup> Block 35 is shared with station 111, Amsterdam 2. Use channels 137 and 139. Note: Stations 11 and 111 can share block as needed by operators.
- <sup>2)</sup> Extended Range Waiver while station 21 closed. While station 85, Niederhorn is not activated, Lyon/Cormaranche can carry on using block 1.
- <sup>3)</sup> Block is shared with station 11, Amsterdam/Schiphol. Use channels 141 and 143. Note: Stations 11 and 111 can share blocks as needed by operators.
- <sup>4)</sup> Block is shared with station 204, Zülpich. Use channels 113 and 115.
- <sup>5)</sup> Block is shared with station 203, Greifath. Use channels 117 and 119.
- <sup>6)</sup> Block is shared with station 210, Worms. Use channels 153 and 155.
- <sup>7)</sup> Block is shared with station 209, Seligenstadt. Use channels 157 and 159.
- <sup>8)</sup> May need to share block 3 with GS208 (Freising). Recommended that Ljubljana uses channels 13 and 15 initially.
- <sup>9)</sup> Extended Range Waiver to be terminated when TFTS coverage is extended to the east (e.g., by stations in Poland & Czech Republic).