

## RRC 04-06

# REFERENCE NETWORKS

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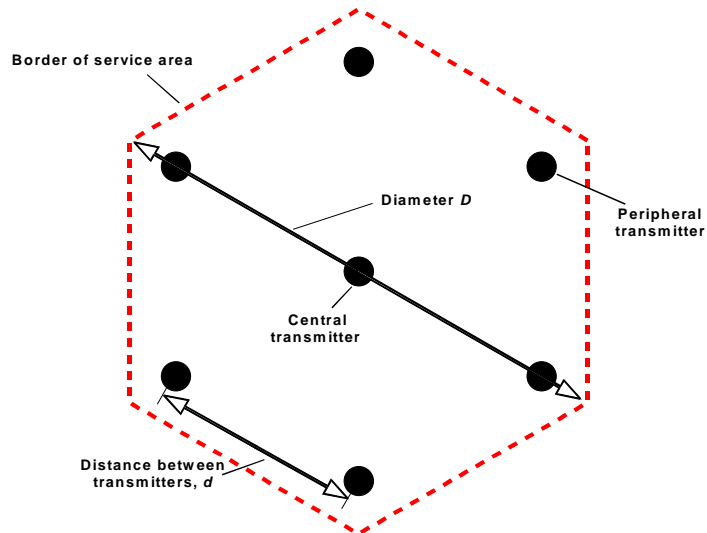
## INTRODUCTION

Reference networks can ease the compatibility analysis and frequency plan synthesis. RRC04 defines 4 reference networks for DVB-T signals and 2 reference networks for T-DAB signals. They can be characterized by the following parameters:

- Number of transmitters
- Distance between transmitters
- Transmitter network geometry
- Transmitter power
- Transmitter antenna height
- Transmitter antenna pattern
- Service area (area to be covered).

The common point between these various networks is the hexagonal shape and it is on this shape that will be based the creation of a reference network.

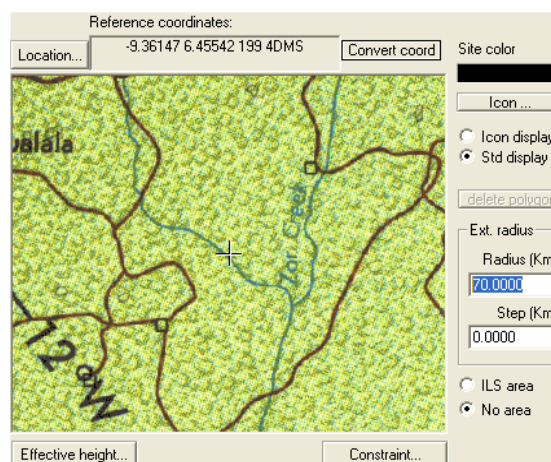
## 1 Reference network 1 for a DVB-T signal (large service area SFN)



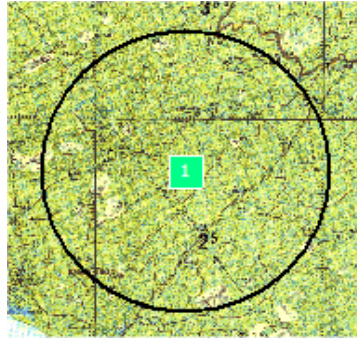
Reference Network RN1

In order to create the service area of the reference network RN1, follow the different steps below :

- Place a station on the map, this station will be the central transmitter of the reference network.  
Set the different parameters of the station according to the data provided by RRC04.
- Then, in the parameter window of the station go to the Site tab and set 70 km in the *Ext. radius* field. This value will represent the distance between transmitters.



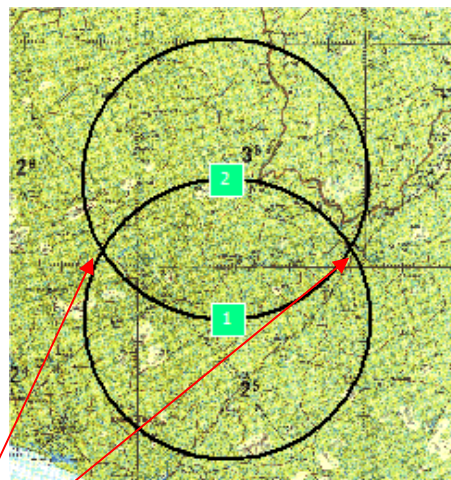
Now the central transmitter is the centre of a circle of 70 km radius.



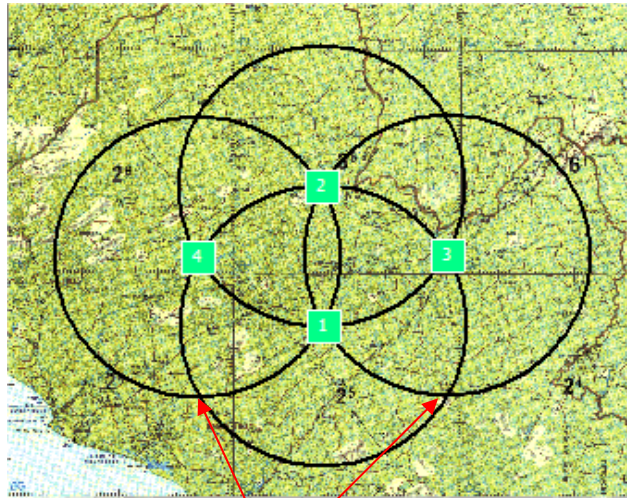
If the circle doesn't appear, go to *Tools/Object properties* and select the *Display extended radius* option.



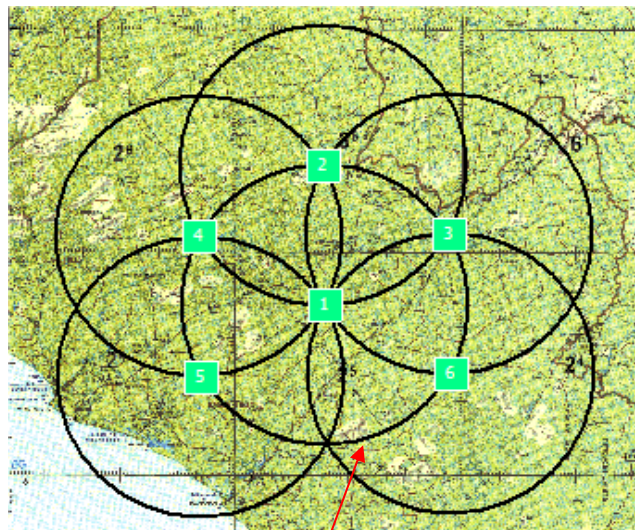
- Define the transmitter as origin point by clicking on F2 on the station.
- Then using the dynamic display in the top bar, add a second station on the circle with an angle of  $0^\circ$  compared to the origin point.



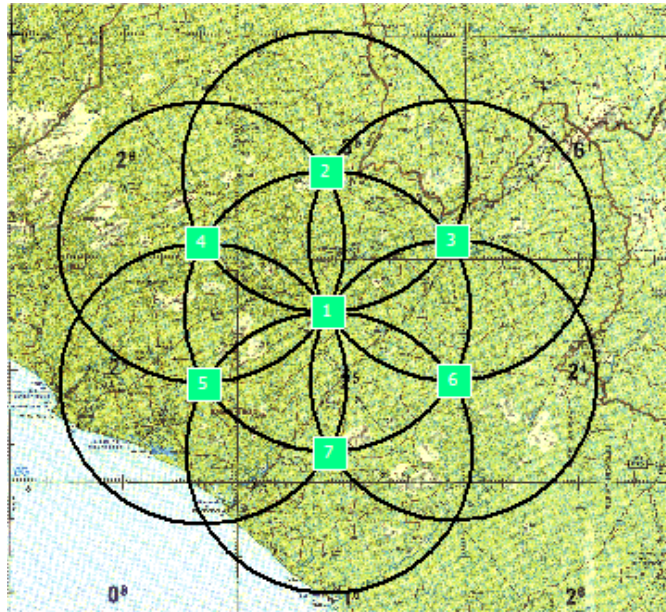
- The intersections of the two circles provide the site of two other peripheral transmitters which form the reference network RN1.
- Create two stations on these sites. The technical parameters of these stations are given in the RRC04.



- The two new points of intersection also give the position of two new peripheral transmitters.
- Create two new stations to these positions.



- The last point of intersection makes it possible to find the site of the last peripheral transmitter.
- Place a last station there, in order to conclude the creation of the reference network.



- For the peripheral transmitters, delete the circles by giving the value 0 km for the radius associated with the stations, in the *Ext. radius* field.

Ext. radius

Radius (Km)

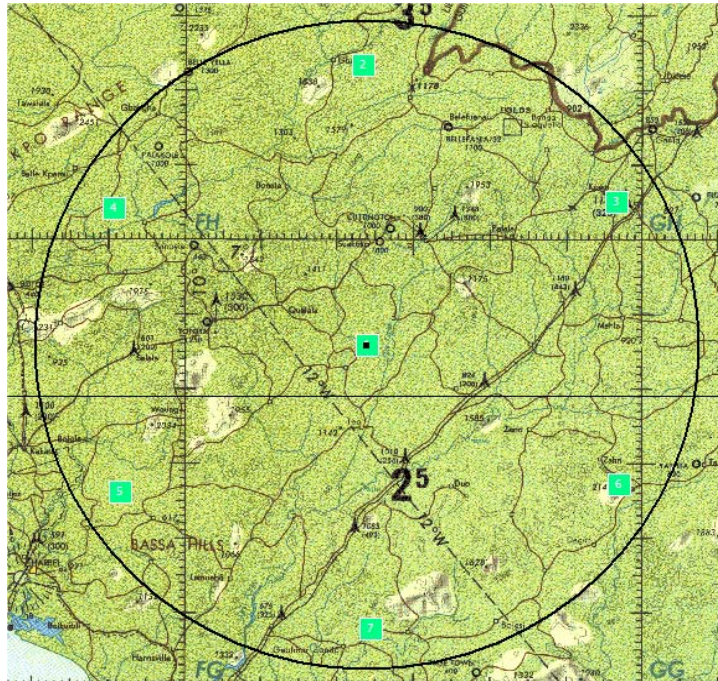
Step (Km)

While for the central transmitter, set the value equal to the service area radius of the reference network,  $161/2 = 80.5$  km.

Ext. radius

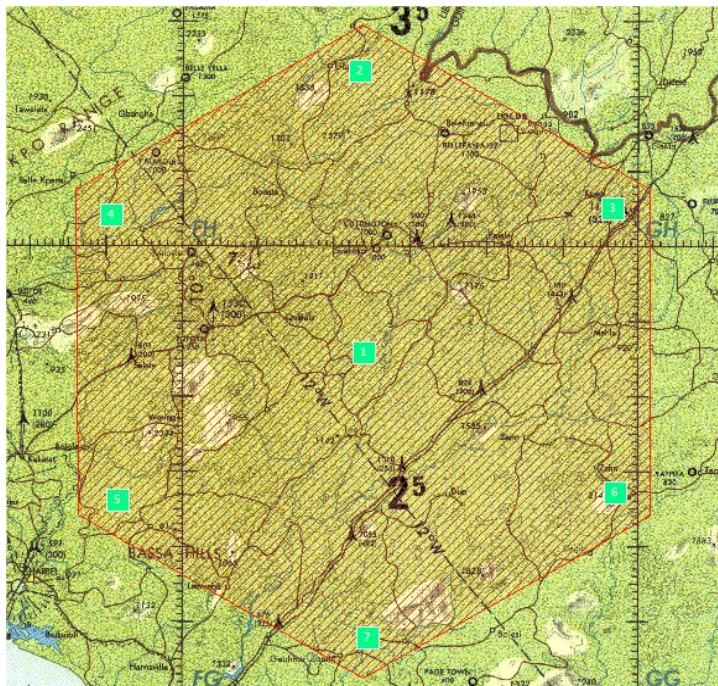
Radius (Km)

Step (Km)



- Now you just have to create the service area by using the Polygon tool, and while placing the test points on the circle, all the 60°.

In order to assign the same polygon or service area to the 7 transmitters of the reference network, save the polygon, and load it 7 times and assign it each time to a different transmitter.

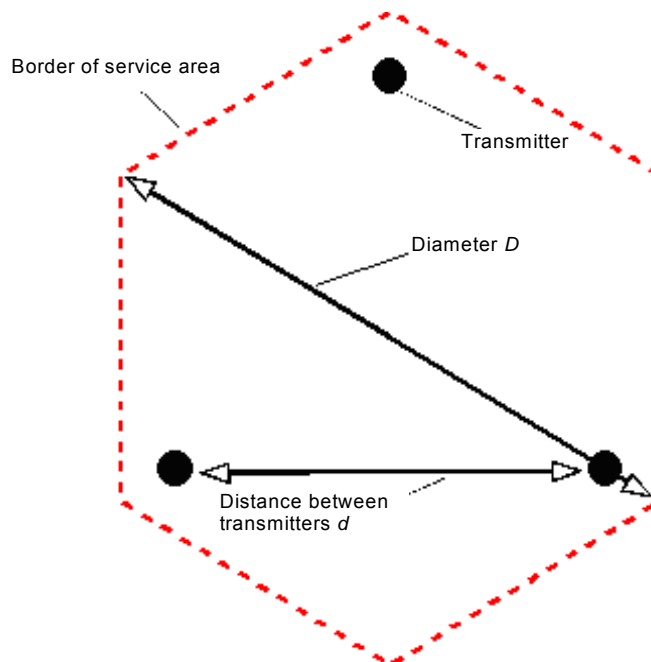


## 2 Reference network 2 (small service area SFNs, dense SFNs)

The network consists of three transmitters located on the vertices of an equilateral triangle. An open network type has been chosen, i.e. the transmitters have non-directional antenna patterns. The service area is assumed to be hexagonal, as indicated here after.

This reference network (RN 2) is applied to different cases : fixed (RPC 1), outdoor/mobile (RPC 2) and indoor (RPC 3) reception, for both Band III and Band IV/V.

RN 2 is intended for small service area SFN coverage. Transmitter sites with reasonable effective antenna heights are assumed to be available for this type of network and self-interference restrictions are expected to be small. Typical service area diameters may be from 30 to 50 km.

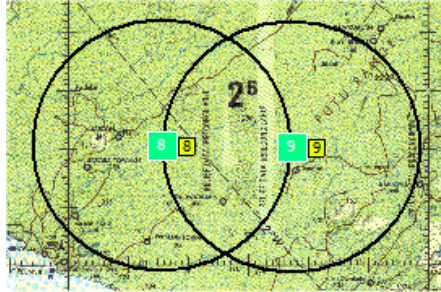


**RN 2 (small service area SFN)**

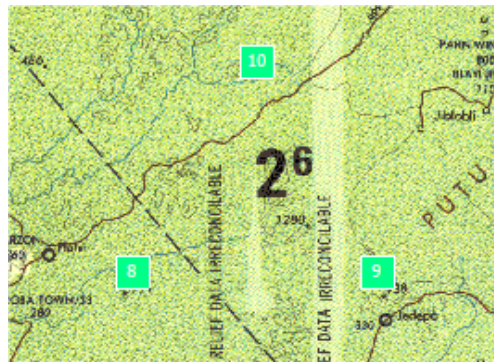
In order to create the service area of the reference network RN2, follow the different steps below :

- Place a station on the map which will be one of the transmitters of the reference network.
- Set the parameters of the station according to the data provided by the RRC04.
- Then, in the parameter window of the station go to the Site tab and set 40 km in the *Ext. radius* field. This value will represent the distance between transmitters.
- Define the transmitter as origin point by clicking on F2 on the station.

- Then using the dynamic display in the top bar, add a second station on the circle with an angle of 90° compared to the origin point.



- At the higher intersection of the two circles, create the last station which will form the reference network RN2, and remove the circles. The three transmitters are the tops of an equilateral triangle.

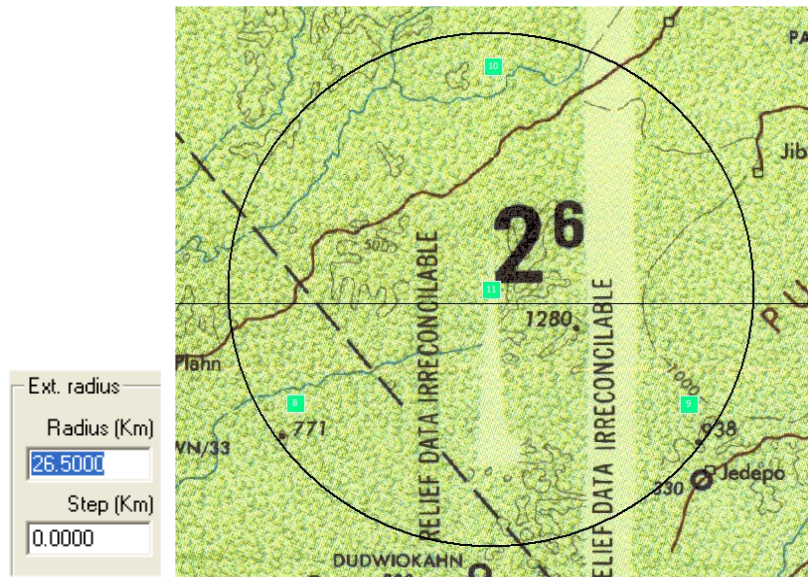


By definition, the centre of an equilateral triangle is at the intersection of the medians, which is equivalent to a distance of  $\sqrt{3}/3 \cdot d$  compared to a summit.

- Therefore, add a station, in the centre of the equilateral triangle, which will be also the centre of the service area.

The centre is at  $\sqrt{3}/3 \cdot 40 = 23.1$  km of one of the tops.

- Define one of the summits as origin by clicking on F2 and create the station.
- In the Site tab, enter the value equal to the radius of the service area of the reference network, that is to say  $53/2 = 26.5$  km

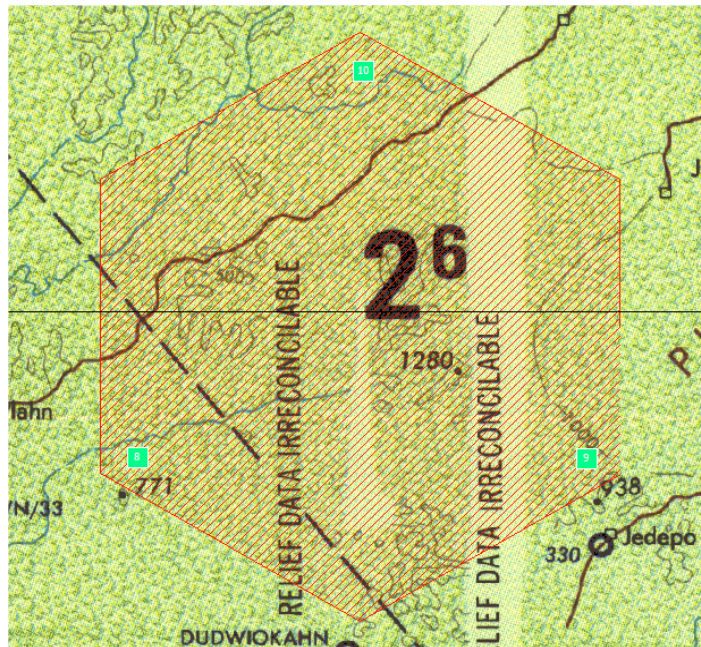


- By taking as origin the centre of the triangle, create the service area by using the Polygon tool, and by placing the test points on the circle, every 60°.

In order to assign the same polygon or service area to the 3 transmitters of the reference network, save the polygon and load it 3 times and assign it each time to a different transmitter.

- Then remove the station which has been used as centre

The service area of a network reference RN2 is created.



### **3 Other reference networks**

The structure of other reference networks is equivalent to the reference networks RN1 and RN2 which are described in the previous sections (hexagonal with 3 or 7 transmitters). Thus, starting from the two methods described above, it is possible to create any reference network as well as the associated service area.