Convención
DE RADIO Y TELEVISION CUBA 2017
& EXPO-FERIA INTERNACIONAL

Señal para Cuba y el Mundo
radio Cuba
RADIOCOMUNICACION

DTT COVERAGE ANALYSIS IN HAVANA CITY BY USING RADIOMOBILE

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It is made a coverage analysis of the seven transmitters for digital terrestrial television in Havana city for field intensity level established in Cuba in UHF band, at ten meters above ground for E(95,50) by using the software Radiomobile

Variations are showing for other heigh with additional attenuations wich simulates conditions for indoor antennae at different elevations.

Digital transmitters net during simultcast phase in Havana city.

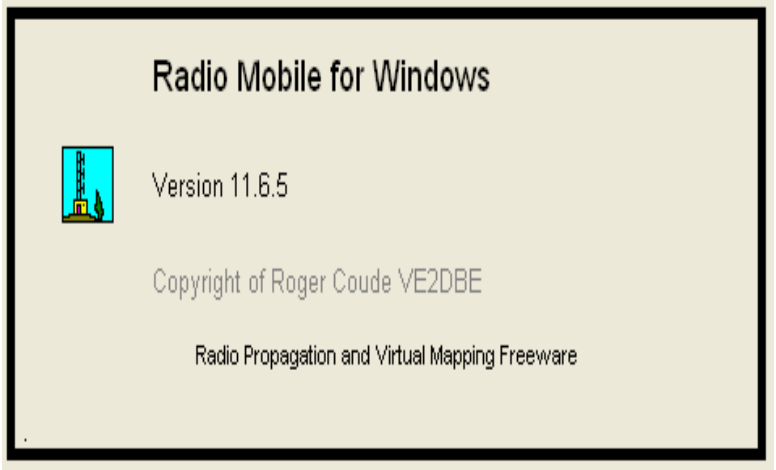
Center	Channel	Service	Power (W)
Televilla	38	SD	5000
	36	HD	2000
Habana Libre	48	SD	1000
	50	HD	700
Balcón de Lawton	31	SD	100
Alamar	51	SD	500
Guanabo	23	SD	100

The coverage of Radio and TV signals in UHF and VHF bands are determined by technical transmission systems parameters and by topography and others characteristics of terrain and environment.

This coverage can be obtain by field measures or can be calculated by using specialist software.

Radiocuba purshased “EMLAB”, a professional specialist software for radioelectric coverage calculus, but there is a restriction; it run in only one machine and requires frecuently updates.

On the other hand there is in the net the free software “Radio Mobile”, specialist for radiolinks design. In order to use it for coverage calculus there are some limitations we need to solve.



Radio Mobile

Radio Mobile use, between others, SRTM files (Shutle Radar Topography Mission) available in the net, wich offers required topographical data with a resolution of 3 sec degree (about 100 m). We have these files for all cuban territory and more.

Radio Mobile

Limitations to be solved for employment Radiomobile in FM and TV broadcast

- RM do not dispose the necessary radiation patterns for this systems

- The thresholds coverage are not especified in dBµv/m as it is required, but in µv receiver sensibility

In this work we solve both limitations and we show diferents situations of real cases for transmitters net in Havana city

Patterns calculus for radiation systems used in DTT transmissions.

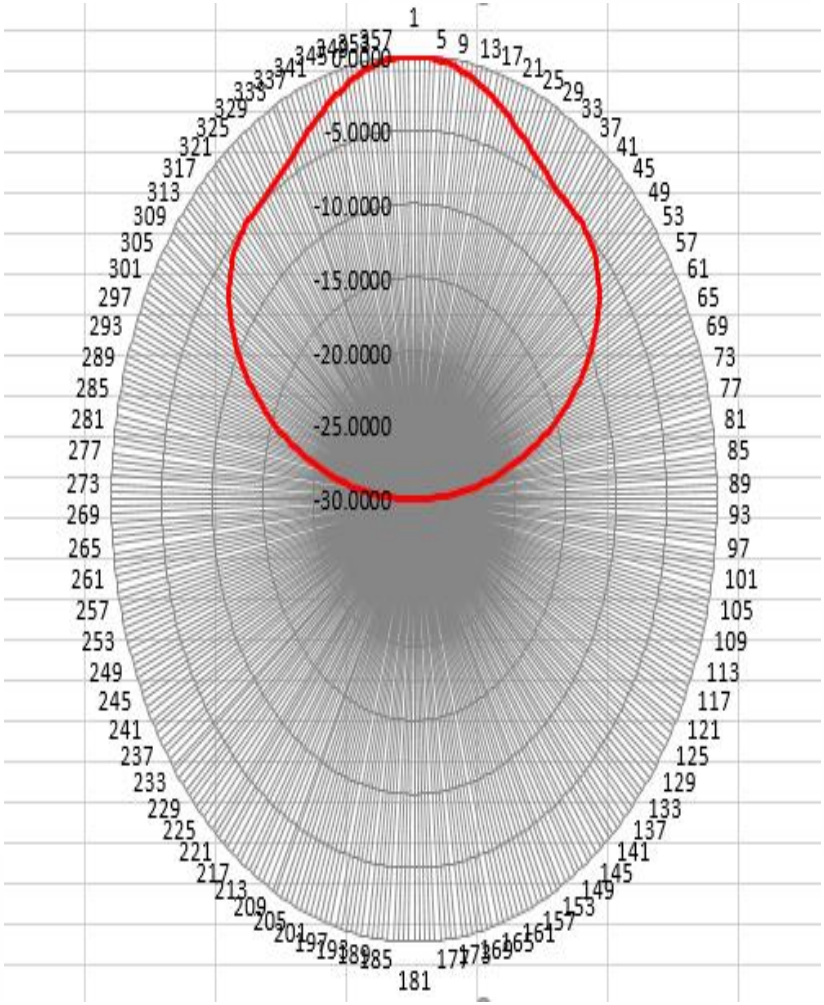
- Single pattern interpolation, starting from knowed data

- Combined pattern calculus, starting from interpolated single patterns

Single pattern interpolation

It is obtained from elementals panels data, such as 3 dB and 6 dB falls angles by using link ecuations for construct the remaining 360 degrees for horizontal pattern and 180 degrees for the vertical one.

Interpolated pattern for a single panel

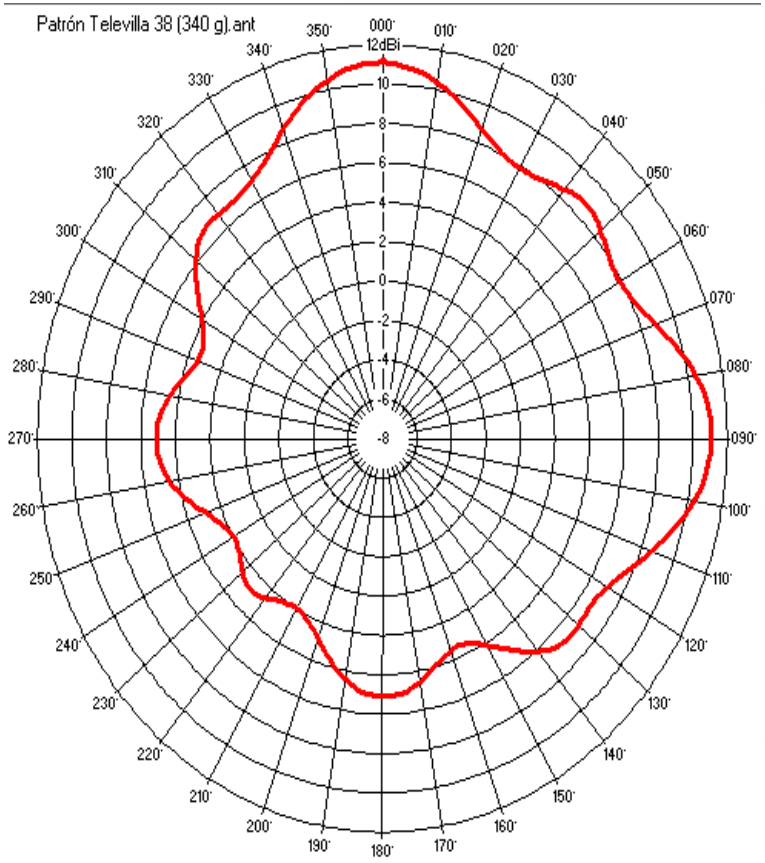


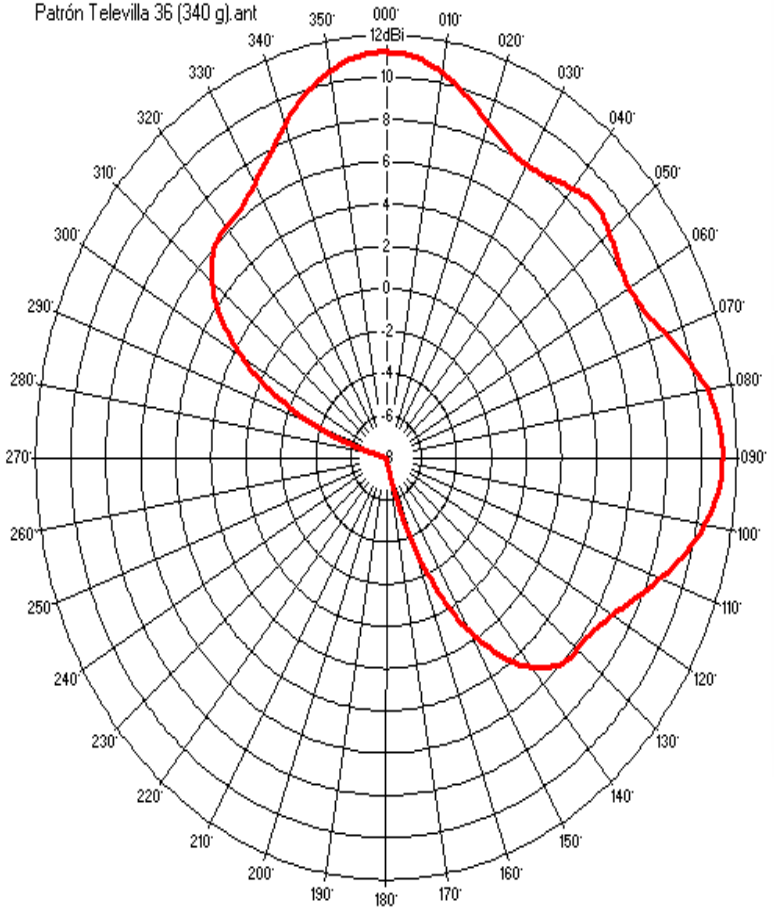
Combinated pattern, starting from single interpolated pattern

Combined pattern is obtained by prosessing the linear and the direct and reverse logaritmic values gains for single panels placed in each face, for horizontal and for vertical patterns. Maximun resulting lobules gains depends of the number of faces and the number of panels per face, given in factory charts

Folowing we show horizontals patterns so obtained for radiation systems in Havana city. Radiomobile operate with them taking account resulting gains and maximun lobules rotations

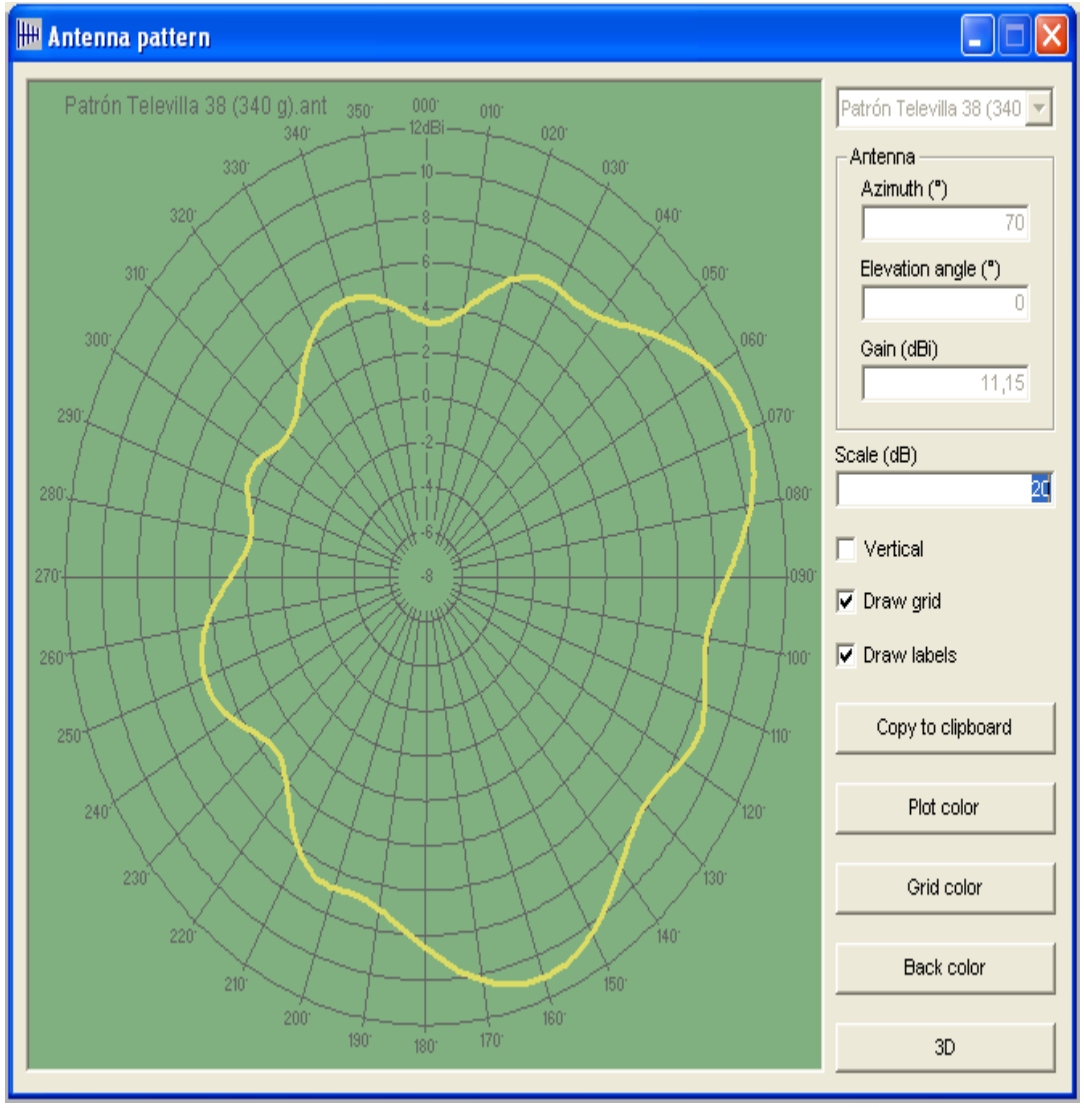
Radiation pattern of 38 Ch





Radiation pattern of 36 Ch

Radiation pattern of 38 CH, gain adjusted and rotated by RM



Receiver sensibility conversion from μv to field intensity

It was clculated for each channel a constant k for a half wave dipole taking account the Poynting vector flux trough the effective area of such dipole, wich make it possible to set in RM the level signal in μv equivalent to field intensity in dbμv/m stablished in norm

Parameters to set in RM for transmitters net

1. Name and frecuency range for each channel, polarization type and climate.

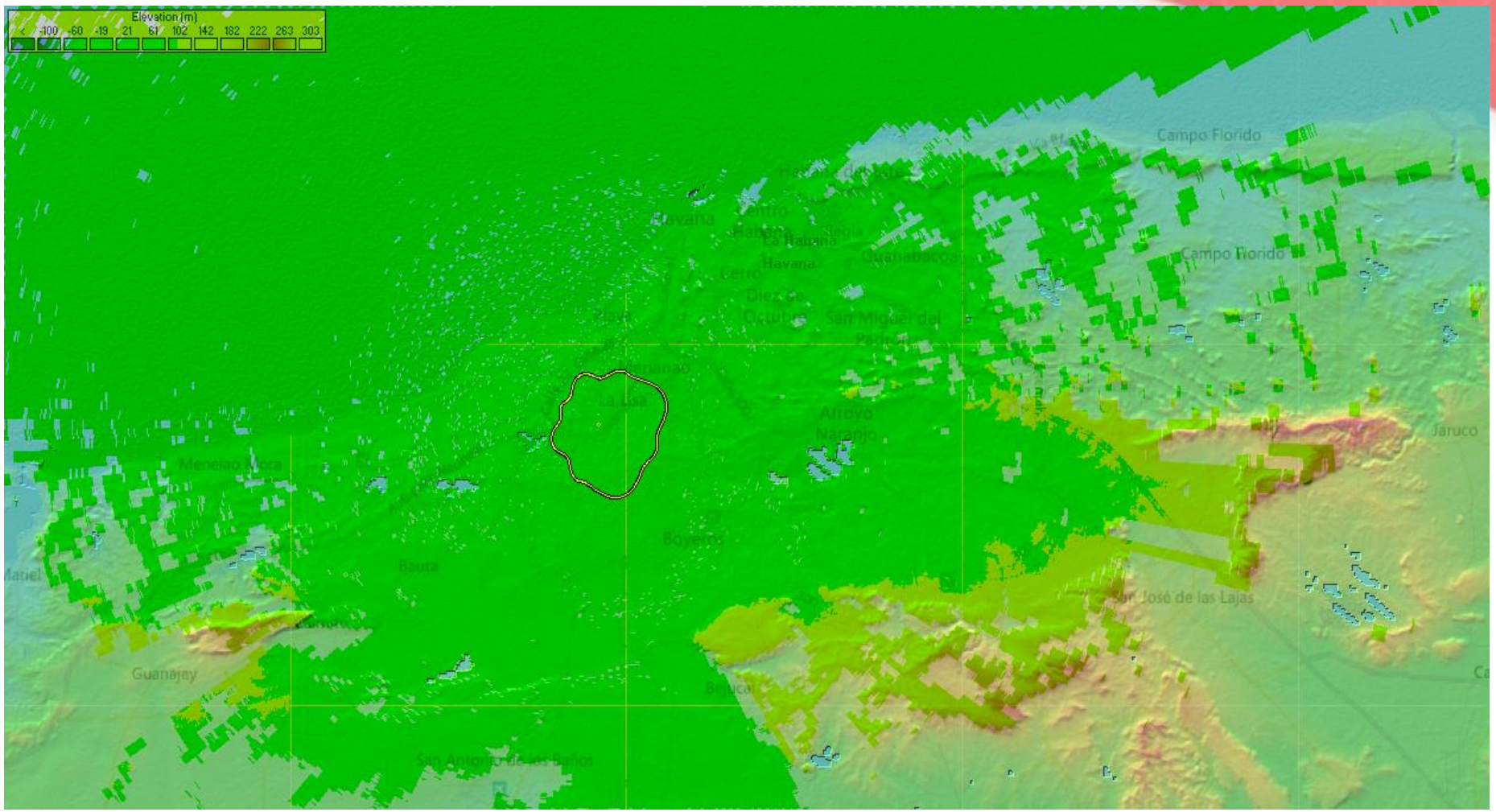
2. Field specification, service kind and urbannity grade.

3. Transmitter power, receiver sensibility, electric heigh of radiating system, antenna gain, radiation pattern, rotation angle and aditional looses in lines, filters, etc.

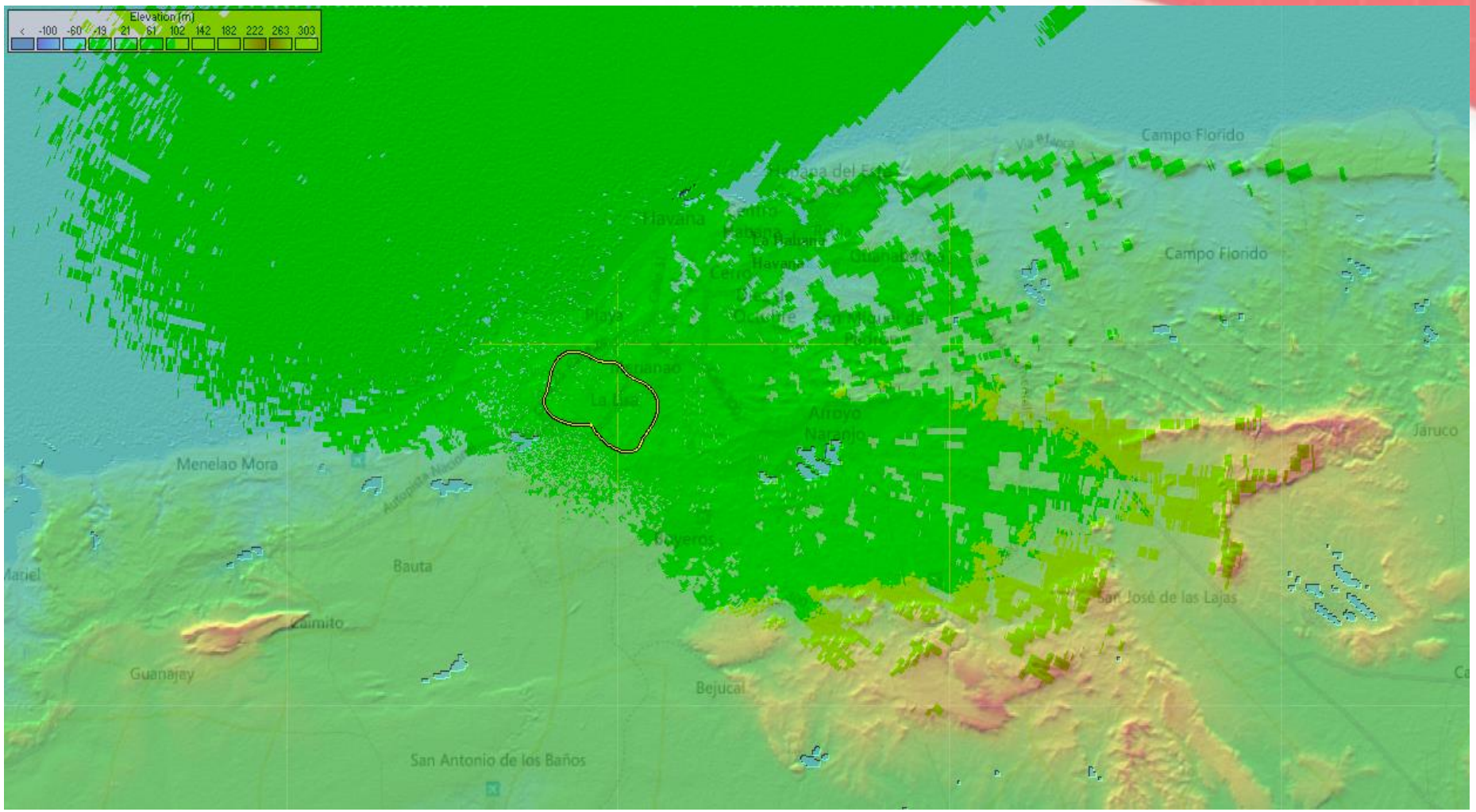
4. Transmitter geographic coordenates and heigh above ground (if it is not especified, RM take it from topographical data)

DTT transmissions coverage in Havana city

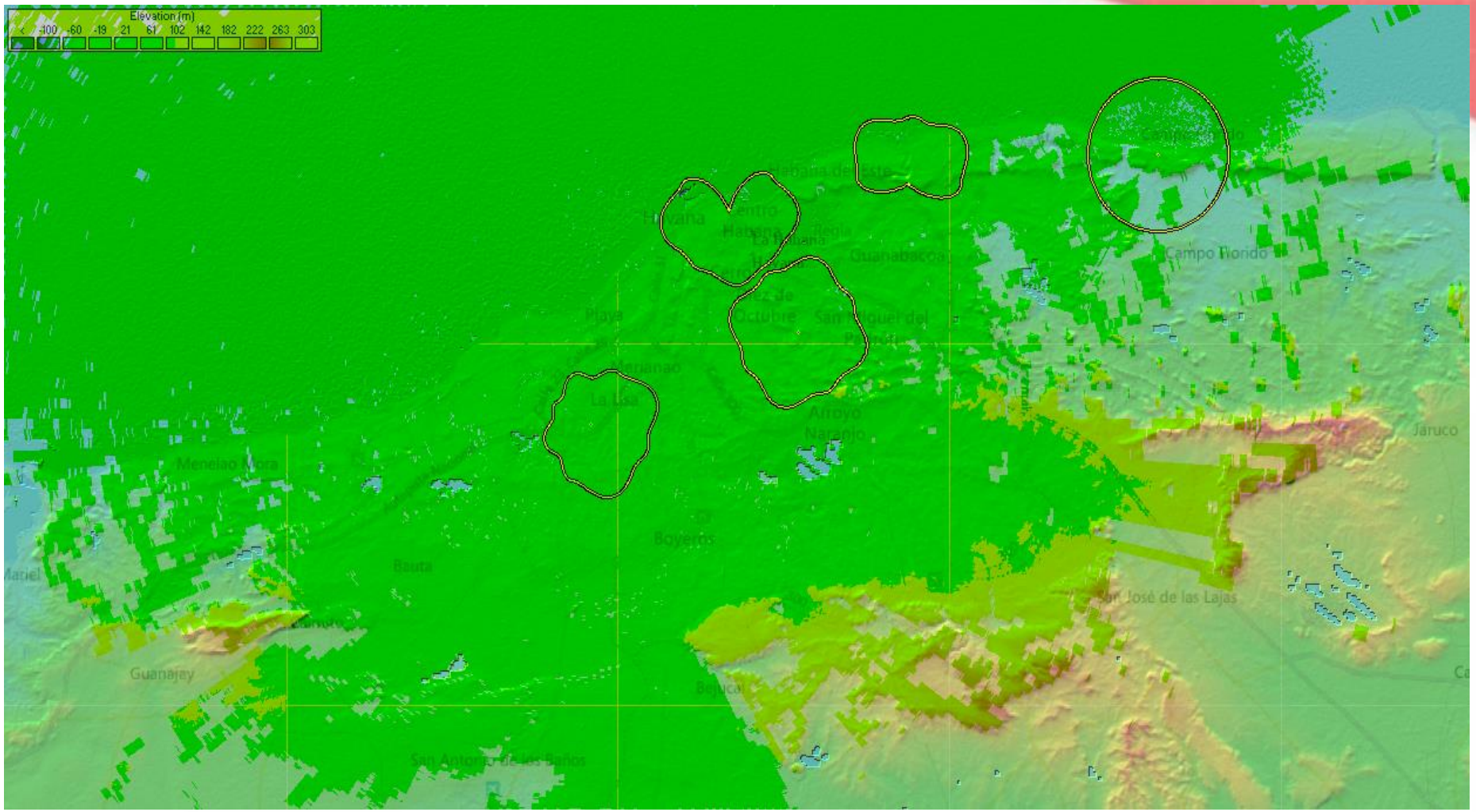
- Coverage for each channel for UHF field intensity norm stablished in Cuba, 54 dBμv/m, horizontal polarization and maritime subtropical climate.
- Receiver antennae at 10 m above ground in broadcast mode for a field E(95,50) (50 % of time in 95 % of locations)
- For all cases in Havana city it is asummed a 50 % urbanity grade.



38 channel coverge (Televilla)



36 channel coverge (Televilla)

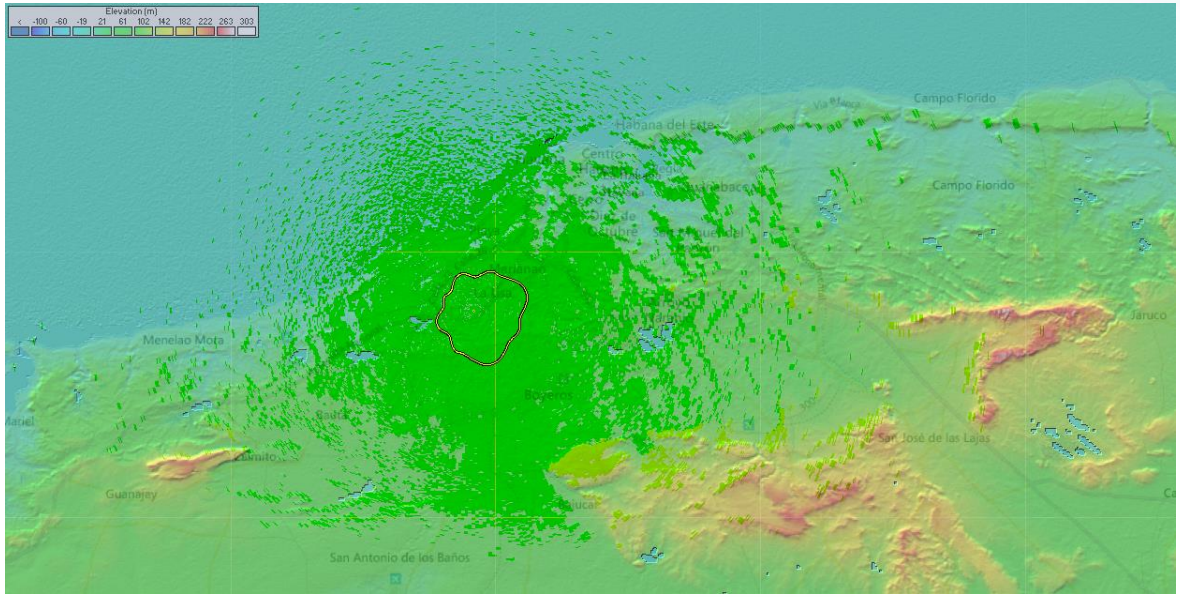


Global DTT coverage in Havana city

DTT transmissions coverage varing antenna heigh of receiver

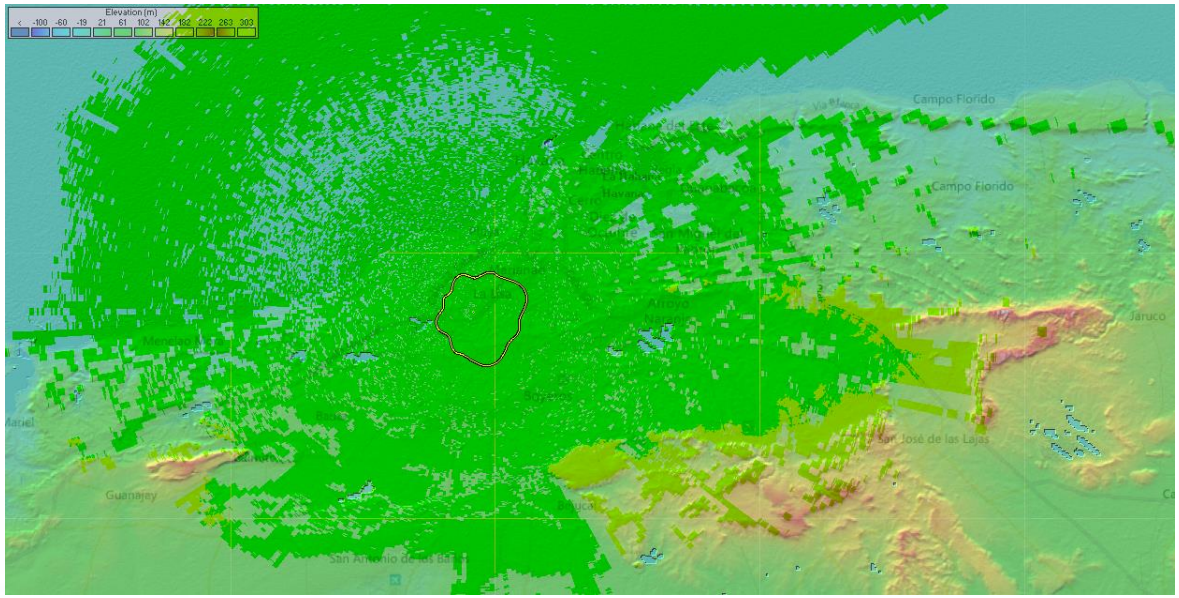
Calculus are making with antenna heigh at 15 m and 1,5 m above ground and an aditional attenuation of **10 dB**, wich simulates an indoor antenna in high floors and ground floor respectively

38 channel coverage

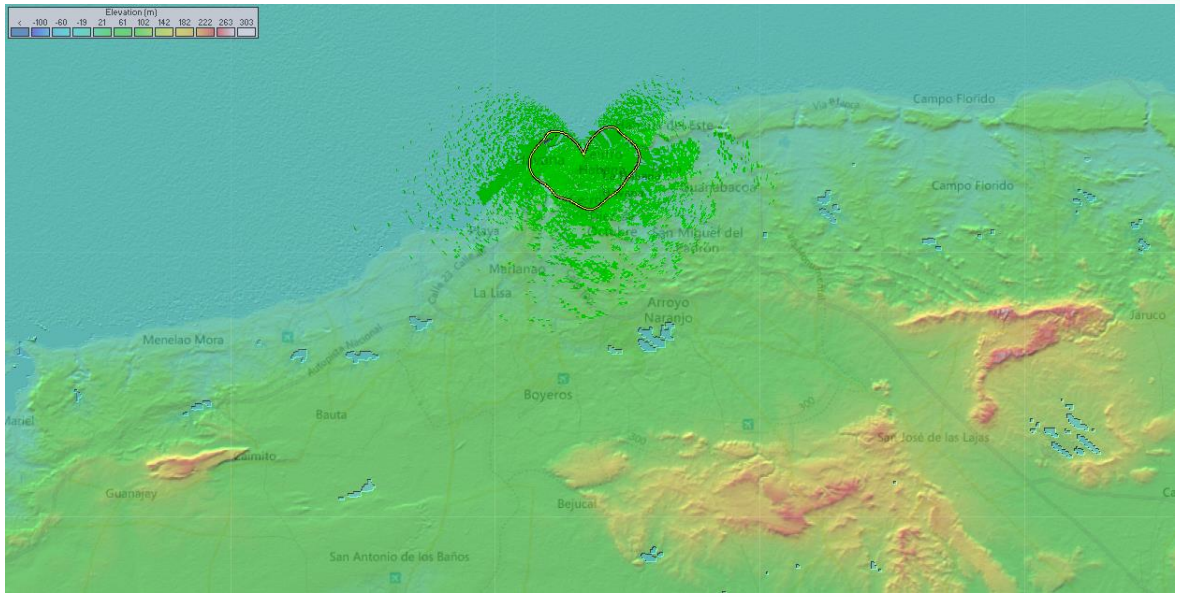


1,5 m antena heigh

15 m antena heigh

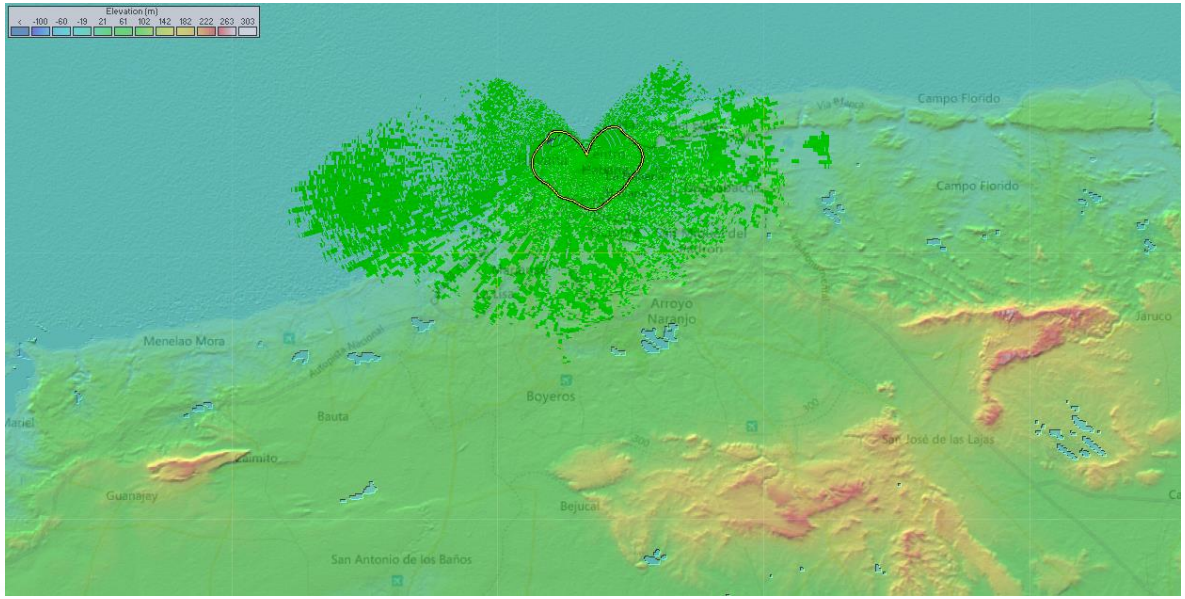


48 channel coverage



1,5 m antena heigh

15 m antena heigh



Conclussions and Recomendations

- As a good advantage, Radiomobile can be used for any technician in any place and explore several variations in locations, power changes, antenna heigh, panel distribution an rotation etc..

- These analysis made for Havana city can be easily extended for the rest of regions by setting technical characteristic of each instalation

Conclussions and Recomendations

- Also it can be used for coverage studies of new scenary that will be a reality in progresive change toward the analogical blackout as much in UHF as in VHF bands.

- The posibility of discern coverages for indor antennae at diferent heigh is a good tool for makes recomendations about that in order to avoid excesives and unnecesary cost for customers.

Thankyou very much