## Radio Quiet Zones Report ITU-R RA.2259







Report ITU-R RA.2259 (09/2012)

ITU

**Characteristics of radio quiet zones** 

RA Series Radio astronomy

#### SQUARE KILOMETRE ARRAY

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IUCAF SM School F. Di Vruno 05/03/2020

### Report ITU-R RA.2259



## "An RQZ is any recognized geographic area within which the usual spectrum management procedures are modified for the specific purpose of reducing or avoiding interference to radio telescopes"

## Report ITU-R RA.2259



- ITU-R report managed by SG7
- Published in 2012
- Currently under review by "rwp7d-rqz" correspondence group within WP7D
- Main body being reviewed, annexes provided by Administrations. (13 annexes describing RQZs)

## **Radio Quiet Zones**



#### Sidney 5e6 people 60+2π dB people

Narrabri 6e3 people **30+5π/2 dB people** 

Murchison 4 people 6 dB people



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# Characteristics of radio astronomy instruments relevant to RQZ

- Geographical characteristics
- Sensitivity
- Frequencies and bandwidth.
- Gain
- Modes of operation
- RFI effects on RAS observations



#### The electromagnetic environment

- Intentional radiators:
  - Licensed
  - Class Licensed
  - Air and Space-borne
- Unintentional radiators:
  - ISM (not intentionally radiating RF)
  - Vehicles
  - Power lines
  - General electrical and electronic equipment
  - Aggregated effect due to growing nearby communities
- Propagation of RFI signals
  - FSPL, diffraction, absorption, ducting, reflection and scattering.



## Methods to achieve an RQZ

- Receive-side considerations
  - Geographical location
  - Site shielding: trees, mountains, etc
- Transmit-side considerations
  - Legislative and regulatory: regulatory framework to control licensed, unlicensed and activities.
  - Physical control of access to the site
  - Legislative control of activities near site
- Alternative technologies and network design
  - TV access by fibre
  - Swapping one coms system by another



RQZ/country	Control of licensed radio transmitters	Control of class-licensed radio devices	Aircraft controls	Control of unintentional radiators
LMT/Mexico	20 km radius – no other radiocommunications			
NRQZ/USA	34 000 sq km area – fixed transmitters required to coordinate			Controls on electronic equipment within 10 miles
ALMA/Chile	No transmitters within 30 km; coordination within 120 km			
Arecibo/Puerto Rico	Restrictions within 4 km; coordination for Puerto Rico and neighbouring islands	Restrictions within 4 km	No fly zone over telescope	Restrictions within 4 km
Various/Australia	Notification zones for coordination to as much as 250 km		No fly zone over telescopes	
MRO/Australia	Frequency band plan – RAS is primary within 70 km; coordination zone to 260 km	Class licences – no interference allowed within 70 km	No fly zone over site	Protocol for electronic equipment used by RAS within 10 km

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## Implications in establishing an RQZ

- Maintenance of the RQZ
  - RFI monitoring
  - Enforcement (internal and external)
  - Outreach
- Increase in capabilities
  - Telescope upgrades, more instruments
- Life of a facility
  - Typical lifetime of a RT of 50yrs
- Evolution of the EMC environment
  - Arecibo example: 1960 "machinery, mechanism, instrument or device, which may cause interference with electromagnetic reception by the facility"



## **RQZ: an oasis for Radio telescopes**

#### - Geographic location:



Effelsberg100 m RT Radius 1.5km Eye alt: 5km SKA-MID RT Radius 65km Eye alt: 260 km

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## **Challenges for an RQZ**



- It is difficult to impose no flight zones, but has ben done.
- UAVs
- HAPS/HIBS/balloons
- NSGO satellites  $\rightarrow$  >40.000?
- Short duration missions  $\rightarrow$  univ projects
- SAR radar constellations → LNA damage (Rec ITU-R RS.2066)
- Prediction of RFI environment → Robust receivers