Definitions:

1. Sweep - Data capture for frequencies between f_{start} and f_{stop}.
2. Snapshot - Single data capture (producing number of samples in 13) for the instantaneous bandwidth in 11 at current center frequency.
3. Upload interval – Duration between file uploads to the cloud server.
4. Channel visit – One instance of tuning to a center frequency with instantaneous bandwidth defined in 11.

Knobs available on Microsoft spectrum observatory:

1. Name -
   Name of the device. This is used for logging purposes only.
   Type: String
   Value: Limit to 64 characters or less

2. Device type –
   Type of the device to scan the data. The values are determined by devices that have been supported in the code base.
   Type: String
   Value: Usrp

3. Start frequency in Hz –
   Frequency, inclusive, at which device should start collecting data.
   Type: Int
   Value: 50000000 (WBX), 2200000000 (SBX)

4. Stop frequency in Hz –
   Frequency, inclusive, at which device should stop collecting data.
   Type: Int
   Value: 2200000000 (WBX), 4400000000 (SBX)

5. Device address –
   Address of the device that is being communicated with.
   Type: String
   Value: 192.168.10.2

6. Gain –
   To adjust the gain (dB) of the USRP. Only applies to USRPs.
   Type: Int
   Value: 38

7. Antenna port –
   Antenna receiver port on the USRP.
   Type: String
   Value: RX1 or RX2

8. Scan pattern –
    a. Standard scan: Based on the start and stop frequencies, the USRP is tuned to take multiple snapshots. The number of snapshots is decided by the instantaneous bandwidth chosen and is given by

        Number of snapshots = (Stop frequency – Start frequency) / Instantaneous bandwidth

        The center frequency of the USRP is retuned sequentially from the lowest to the highest frequency. The below diagram describes the process.

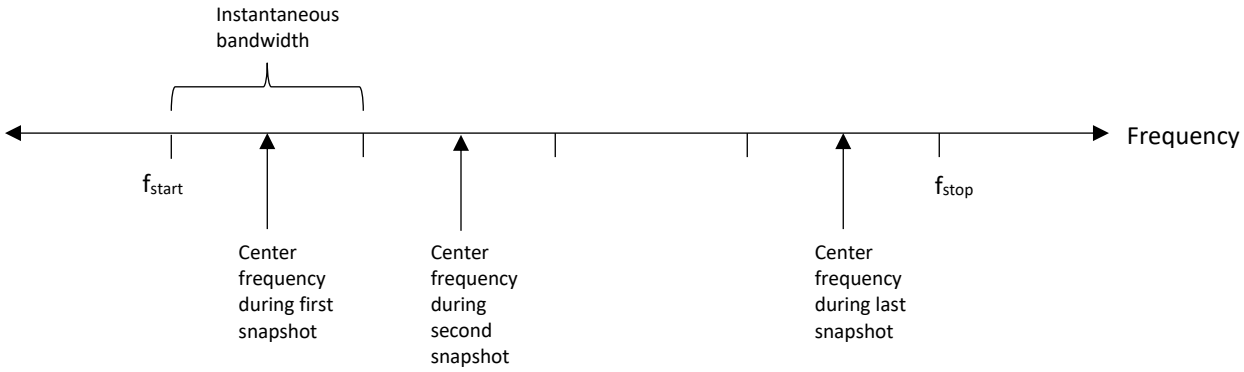

Fig. 1

    b. DC spike adaptive scan: To remove the DC spike at the USRP center frequency, this scan method is used. First, a standard scan (discussed in part a.) is implemented. Second, a standard scan with a new start frequency is implemented. The new start frequency is given by

        $f_{new\ start} = f_{start} + (1/3)*(\text{Instantaneous bandwidth})$
        $= f_{start} + f_{offset}$

        For the power spectral density charts, the FFT of both the scans are taken and for every snapshot in the first scan, the center $1/3^{rd}$ of the FFT values are replaced by the corresponding FFT values from the second scan. The below diagram describes the same.

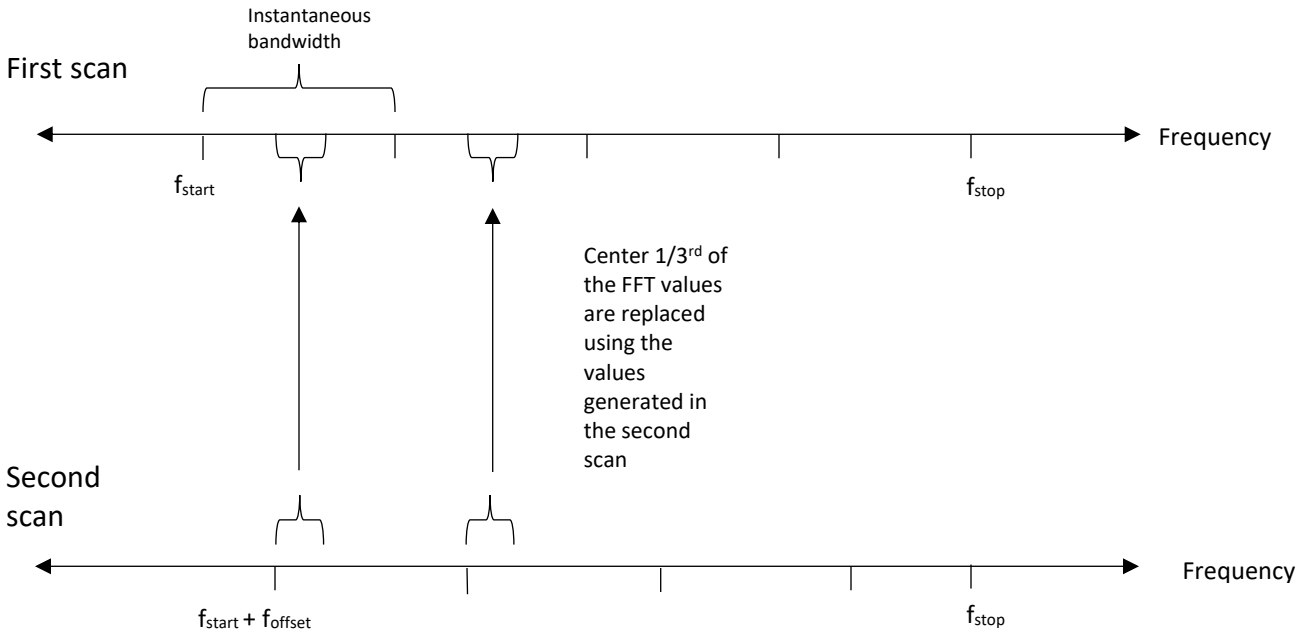

Fig. 2

Type: String
Value: “StandardScan” or “DCSpikeAdaptiveScan”

9. Communication channel –
   String that specifies the communication channel being used.
   Type: String
   Value: “addr” – IP based communications, “serial” – USB based communications.

10. Locking communication channel –
    Applies only if the hardware has a call to see if the sensor is locked after tuning to a new frequency.
    Type: Boolean
    Value: N200 – true, B200 – false.

11. Instantaneous bandwidth –
    Value entered should be in Hz.
    Type: Int
    Value: 25000000

12. Tune sleep –
    The duration of time to wait after tuning the USRP center frequency.
    Type: Int
    Value: 0 (in seconds)

13. Samples per snapshot –
    Indicates number of samples to capture for each snapshot.
    Type: Int

Value: 512, 1024, etc.

14. Number of snapshots per channel visit –
    Number of samples to take before retuning the RF sensor.
    Type: Int
    Value: 1

15. Number of snapshots to throw away –
    Number of snapshots to throw away after tuning the RF Sensor.
    Type: Int
    Value: 0

16. GPS enabled –
    This will output GPS data to the scan files and the raw IQ data files if the device supports GPS.
    Type: Boolean
    Value: true or false

Experiment 1: Time averaged PSD

1. Minutes of data per upload file (.dsox) –
   Interval (in minutes) for upload of dsox file to the cloud server. This value must be greater than or equal to 60.
   Type: Int
   Value: 60

2. PSD average duration –
   Period of time-averaging interval for PSD report. A maximum, minimum and average will be calculated for this time period.
   Type: Int
   Value: 60 (in seconds)

Experiment 2: Raw IQ

1. Output data –
   Used to determine if a raw IQ data files are written. The default value is ‘true’. This is only supported if the device supports this.
   Type: Boolean
   Value: true or false

2. Start frequency in Hz –
   Frequency, inclusive, at which device should start collecting data.
   Type: Int
   Value: frequency in Hz

3. Stop frequency in Hz –
   Frequency, inclusive, at which device should stop collecting data.
   Type: Int
   Value: frequency in Hz

4. Seconds of data per upload file (.dsor) –
   Seconds of data written to a file before creating another one.
   Type: Int
   Value: 300 secs (for 5 mins)

5. Retention seconds -
   Duration that a Raw IQ data file (.dsor) can be retained on the host PC (time to live) *, If it has not been uploaded by uploader (Fig. 3).
   Type: Int
   Value: 3600 secs (for 1 hour)

   *Any dsor file is deleted after this duration.

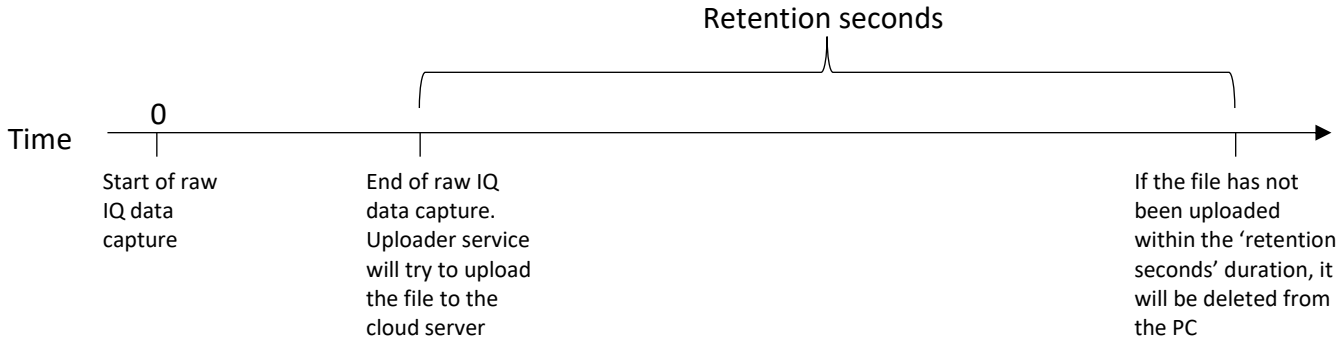

Fig. 3