

## #1. Contiguous data collection, without retuning.

### USRP To PC

Data generated by USRP, per second (assuming 25MS/S, no decimation):

$$25 \text{ MS/S} * 4 \text{ Bytes/Sample}$$

=100MByte/s.

Duty Cycle	Generated Data per Minute
1/60	100MByte/min
2/60	200MByte/min
10/60	1GByte/min
1	6GByte/min

### PC to Cloud

Data uploaded:

$$25 \text{ MS/S} * 16 \text{ Bytes/Sample} * \text{Compression Rate}$$

Which is **roughly equal to the amount of data actually generated per minute** (assuming 75% compression rate), or **slightly larger than that** (due to the inefficient file structure and the compression algorithms). I usually expect about twice of the size of the generated data. Observed compression rate is approx. 30%~75%, highly dependent to the entropy of the measured signal.

This is not how the CityScope stations are designed to behave (yet): They do not collect IQ data continuously, and include the frequency retune delay into the duty cycle calculation. Therefore, these stations tend to generate much smaller data per a unit time (it is theoretically possible to achieve similar data rates by carefully tuning the knobs, though, if the connection between the station and the cloud and the processing speed of the cloud is capable enough).

## #2. Data collection, with retuning

### USRP To PC

Data generated, per second (assuming 25MS/S, no decimation):

$$\frac{1 \text{ s}}{\text{processing delay} + \text{retune delay} + \text{data collection delay}} * \text{Samples per snapshot} * 4 \text{ Byte}$$

Using “Samples per Snapshot” = 1024 and (retune delay + processing delay) of 1.2ms, it is approximately 2.7MB/s.

\*I am using the term “snapshot” as I am referring to the name of the configuration knob.

Duty Cycle	Generated Data per Minute (Estimated)	Generated Data per Minute (Measured)
1/60	3.25MB/min	3.20MB/min
2/60	6.51MB/min	6.30MB/min

10/60	32.55MB/min	-
1	195MB/min	-

#### PC to Cloud

Again, the uploaded data are slightly larger than this, and I approximate that by multiplying the values in the above table by two.

This is the current implementation of the software. Recent update enforced the duty cycle system, but did not change the data collection pattern.

#### **#2a. Data collection, with retuning, StandardScan mode + Off Cycle PSD Output Enabled.**

\*This is a special case where the I-Q data collection speed is halved due to the implementation of the station software (Scanner only dumps half of the snapshots taken in this mode).

#### USRP To PC

Data generated per second (assuming 25MS/S, no decimation): Equation in above section (2) divided by 2.

Using “Samples per Snapshot” = 1024 and (retune delay + processing delay) of 1.2ms, it is approximately 1.35MB/s.

\*I am using the term “snapshot” as I am referring to the name of the configuration knob.

<b>Duty Cycle</b>	<b>Generated Data per Minute (Estimated)</b>	<b>Generated Data per Minute (Measured)</b>
1/60	1.625MB/min	-
2/60	3.255MB/min	-
10/60	16.25MB/min	-
1	97.5MB/min	-

#### PC to Cloud

Again, the uploaded data are slightly larger than this, and I approximate that by multiplying the values in the above table by two.

This is a special case of the current implementation of the software. It only occurs when both StandardScan mode and “Off Cycle PSD Output” mode are enabled. It behaves as described in section 2 above otherwise.