## http://soma.ece.mcmaster.ca/ipix/

## McMaster IPIX Radar Specifications

**Key Features**

* X-band - 3cm wavelength
* Fully Coherent
  + Doppler measurements
  + clutter suppression
* Dual Linear Polarization
  + pulse-to-pulse transmit switching
  + simultaneous dual polarization on receive
  + full polarization matrix with two pulses
* Pulse Compression
  + 5 meter resolution
  + increased average power
* Arbitrary Transmit Waveforms
  + 25 MHz bandwidth
* Multi-Frequency Operation
  + dual simultaneous transmit frequencies
  + frequency agility
  + resolve scales down to 30 cm
  + above features result in an increased range resolution and an increased number of independent samples for better reflectivity and Doppler spectrum estimates
* Computer control
  + extremely flexible configuration
* Digital Data Acquisition
  + raw data archived
* External/Internal Calibration
* In-Field Real-Time Analysis and Display Capability
* Transportable
  + 40 foot equipment trailer
  + separate antenna pedestal/trailer

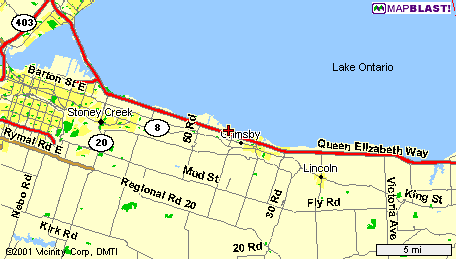
**Transmitter Specifications**

|  |
| --- |
|  |
| Type | Travelling Wave Tube Amplifier |
| Frequency | 9.39 GHz (fixed) |
|  | 8.9 to 9.4 GHz (agile) |
| Peak power | 8 KW |
| Pulse Length | 20 ns to 5000 ns (real) |
|  | 5000 ns (expanded) |
|  | 32 ns (compressed) |
| PRF | 0 to 20 KHz |
| Polarization | Linear, H or V |
|  | Pulse-to-pulse switchable |
|  |  |
| **Receiver Specifications** | |
| Number | 2 |
| Outputs | Linear, I and Q |
| Signal | H or V |
|  | Fixed or agile |
| BW | 5.5 MHz (Gaussian) |
|  | 50 MHz (chirp) |
|  | 100 MHz |
| Noise figure | 1.2 dB |
| Minimum range | 150 m typ. |
| Sensitivity | 10 dBZ at 150 Km |
|  | -35 dBZ at 10 km vert cloud profile |
|  |  |
| **Antenna Specifications** | |
| Type | Linear dual-polarized |
|  | Parabolic reflector |
|  | Center fed |
| Size | 2.4 m |
| Beamwidth | 1.1 degrees |
| Gain | 45.7 dB |
| Isolation | 30 dB (X-pol) |
| Rotation | Elev. over azm. |
|  | 0 to 10 RPM (azm.) |
|  |  |
| **Data Acquisition System** | |
| Sample rate | 0 to 50 MHz |
| Outputs | Linear, I and Q |
| Quantization | 8 or 10 bits - up to 16 bit effective with H/W decimation |
| Sample gating | Range, azimuth, elevation |
| Capacity | 64 Msamples |

## Map of the IPIX Radar at Grimsby, Ontario

### Overview map

East of the "Place Polonaise" at Grimsby, Ontario, looking at Lake Ontario from a height of 20 m. The nearest shore on the far side of the lake is more than 20 km away. The city on the left is Hamilton, 50 kms east is Niagara Falls. Latitude/Longitude: 43.2114° N, 79.5985° W.



Thumbnails left of plots show circle of 8 km radius, indicating land (dark gray); sea (light gray); radar beam (blue, 8 times wider than real beam); radar range (between two blue circles); radar scan motion, if any (blue shadow, width decreases with time); approximate wind direction (red arrow).

|  |  |  |
| --- | --- | --- |
|  | **File 120: 19980226\_214317\_antstep.cdf** | |
| mm_19980226_214317_antstep.png | 1809 | 19980226_214317_antstep.png | [target information not yet available].Range resolution 30 m, sampled at 30 m.  [Parameters](#_File:_19980226_214317_antstep.cdf) | |
| *range*[m] |
| 999 |
|  | **File 122: 19980226\_215015\_antstep.cdf** | |
| mm_19980226_215015_antstep.png | 1611 | 19980226_215015_antstep.png | [target information not yet available].Range resolution 30 m, sampled at 30 m.  [Parameters](#_File:_19980226_215015_antstep.cdf) | |
| *range*[m] |
| 801 |
| **File 105: 19980223\_191919\_antstep.cdf** | | | |
| mm_19980223_191919_antstep.png | 3399 | 19980223_191919_antstep.png | | [target information not yet available].Range resolution 3 m, sampled at 3 m.  [Parameters](#_File:_19980223_191919_antstep.cdf) | |
| *range*[m] |
| 3300 |

**所给数据包含I[hv] Q[hv] range azum elev 等数据，hv表示发射水平极化接收垂直极化（其他类推），range为距离单元所处距离，azum为方位角，elev为俯仰角(这两个参数基本不变)**

#### File: 19980226\_214317\_antstep.cdf

%% Variables:

RF\_frequency = 9.39 GHz

Pulse\_length = 200 nanoseconds

PRF = 1000 Hertz

Unambig\_velocity = 7.9872 metres per second

range = [999 1029 ..nrange.. 1809] metres

azimuth\_angle = [339.873 339.873 ..nsweep.. 339.873] degrees

elevation\_angle = [359.7913 359.7913 ..nsweep.. 359.7913] degrees

radar\_lat = 43.21 degrees

radar\_lon = 79.6 degrees

radar\_elev = 20 metres

antenna\_beamwidth = 0.9 degrees

antenna\_gain = 45.7 dB

like\_stc\_RF = 0 volts

cross\_stc\_RF = 0 volts

like\_stc\_IF = 1.2488 volts

cross\_stc\_IF = 0.84961 volts

decimation = 1 none

adc\_like\_I = 2

adc\_like\_Q = 3

adc\_cross\_I = 0

adc\_cross\_Q = 1

nadc\_bits = 10 none

adc\_data = [nsweep x ntxpol x nrange x nadc] ADC output

%% Dimensions:

nsweep = 60000

ntxpol = 2

nrange = 28

nadc = 4

%% Global attributes:

Organization = McMaster University

Instrument\_name = IPIX X-band Polarimetric Coherent Radar

Campaign = Grimsby

Site = Grimsby, ON

Data\_collection\_date = 1998/02/26 21:43:17

TX\_polarization = A

NetCDF\_file\_name = 19980226\_214317\_antstep.cdf

NetCDF\_creation\_routine = make\_Grimsby\_ncdf

NetCDF\_creation\_date = Wed Sep 12 19:43:09 2001

Field\_CD\_name = ipixcd15

Field\_file\_dir = Feb2698a

#### File: 19980226\_215015\_antstep.cdf

%% Variables:

RF\_frequency = 9.39 GHz

Pulse\_length = 200 nanoseconds

PRF = 1000 Hertz

Unambig\_velocity = 7.9872 metres per second

range = [801 831 ..nrange.. 1611] metres

azimuth\_angle = [335.5115 335.5115 ..nsweep.. 339.9445] degrees

elevation\_angle = [359.7913 359.7913 ..nsweep.. 359.7913] degrees

radar\_lat = 43.21 degrees

radar\_lon = 79.6 degrees

radar\_elev = 20 metres

antenna\_beamwidth = 0.9 degrees

antenna\_gain = 45.7 dB

like\_stc\_RF = 0 volts

cross\_stc\_RF = 0 volts

like\_stc\_IF = 1.2488 volts

cross\_stc\_IF = 0.84961 volts

decimation = 1 none

adc\_like\_I = 2

adc\_like\_Q = 3

adc\_cross\_I = 0

adc\_cross\_Q = 1

nadc\_bits = 10 none

adc\_data = [nsweep x ntxpol x nrange x nadc] ADC output

%% Dimensions:

nsweep = 60000

ntxpol = 2

nrange = 28

nadc = 4

%% Global attributes:

Organization = McMaster University

Instrument\_name = IPIX X-band Polarimetric Coherent Radar

Campaign = Grimsby

Site = Grimsby, ON

Data\_collection\_date = 1998/02/26 21:50:15

TX\_polarization = A

NetCDF\_file\_name = 19980226\_215015\_antstep.cdf

NetCDF\_creation\_routine = make\_Grimsby\_ncdf

NetCDF\_creation\_date = Wed Sep 12 19:45:50 2001

Field\_CD\_name = ipixcd15

Field\_file\_dir = Feb2698a

#### File: 19980223\_191919\_antstep.cdf

%% Variables:

RF\_frequency = 9.39 GHz

Pulse\_length = 20 nanoseconds

PRF = 1000 Hertz

Unambig\_velocity = 7.9872 metres per second

range = [3300.0002 3303 ..nrange.. 3399.0002] metres

azimuth\_angle = [45.1428 45.1428 ..nsweep.. 45.0385] degrees

elevation\_angle = [359.7968 359.7968 ..nsweep.. 359.7913] degrees

radar\_lat = 43.21 degrees

radar\_lon = 79.6 degrees

radar\_elev = 20 metres

antenna\_beamwidth = 0.9 degrees

antenna\_gain = 45.7 dB

like\_stc\_RF = 2.998 volts

cross\_stc\_RF = 2.998 volts

like\_stc\_IF = 1.2488 volts

cross\_stc\_IF = 0.94971 volts

decimation = 1 none

adc\_like\_I = 2

adc\_like\_Q = 3

adc\_cross\_I = 0

adc\_cross\_Q = 1

nadc\_bits = 10 none

adc\_data = [nsweep x ntxpol x nrange x nadc] ADC output

%% Dimensions:

nsweep = 60000

ntxpol = 2

nrange = 34

nadc = 4

%% Global attributes:

Organization = McMaster University

Instrument\_name = IPIX X-band Polarimetric Coherent Radar

Campaign = Grimsby

Site = Grimsby, ON

Data\_collection\_date = 1998/02/23 19:19:19

TX\_polarization = A

NetCDF\_file\_name = 19980223\_191919\_antstep.cdf

NetCDF\_creation\_routine = make\_Grimsby\_ncdf

NetCDF\_creation\_date = Wed Sep 12 17:19:38 2001

Field\_CD\_name = ipixcd14

Field\_file\_dir = Feb2398b