

SeaSonde 10

CrossSpectra File format

Oct 26, 2005

CrossSpectra files are produced by the SeaSonde Radial Site and contain a snapshot in time of the ocean state in a cross spectra format produced by measurements from the three cross loop antennas.

SeaSondeAcquisition creates raw cross spectra in the "CODAR/SeaSonde/Data/Spectra/SpectraSeries/" folder. SeaSonde 10 Release 4 saves the raw cross spectra as "CSQ_XXXX_YY_MM_DD_HHMMSS.cs" XXXX is the site name; YY is the year, MM is the Month, HHMMSS is the 24hour/minute/second time. Optionally, It can be configured to name the files "Cross Spectra #" where # is a sequential number. When the number passes 9999, the number wraps to one.

CSPro reads the raw files and produces 'CSS_XXXX_YY_MM_DD_HHMM' files in the "Cross Spectra" folder. XXXX is the site name; YY is the year, MM is the Month, HHMM is the 24hour/minute time. 'CSS' stands for CrossSpectra short time, which on a standard SeaSonde covers 15 minutes with an output time every 10minutes.

SeaSonde Spectra Processing averages the CSS files and produces a 'CSA_XXXX_YY_MM_DD_HHMM' normally every hour. 'CSA' stands for CrossSpectra Averaged. The 'CSA's are not normally used for radials and are used only for wave spectral processing..

The files are in a binary format.

They have a variable size header section followed by the cross spectra products.

The file uses Big-Endian byte ordering (**M**ost**S**ignificant**B**yte first. This means that on Intel platforms, you will need to swap the byte order for the variable being read.)

IEEE floats & doubles.

Two's complement, integer values.

Data Type Definitions:

UInt8	Unsigned 8bit integer
SInt8	Signed 8bit integer
UInt16	Unsigned 16bit integer
SInt16	Signed 16bit integer
UInt32	Unsigned 32bit integer
SInt32	Signed 32bit integer
UInt64	Unsigned 64bit integer
SInt64	Signed 64bit integer
Float	IEEE single precision floating point number (4bytes)
double	IEEE double precision floating point number (8bytes)
size4	Unsigned 32bit integer indicating the size of following data
char4	Four character code (meaning that the next four bytes make a four character string)
chr64	64byte string zero terminated
complex	2 IEEE single precision floating point numbers of real,imag (8bytes, 4bytes each float)

Each File has two sections. A Header section and a CrossSpectra data section.

The Header section is as follows:

- The header is expandable. Each newer version also contains the information
- used the by older version. When reading a CrossSpectra file that is newer
- in version than you expect then use the Extent field to skip to the end of
- the header.

Cross Spectra file contents:

-All versions start with this:

SIInt16	nCsaFileVersion	File Version 1 to latest (This Header is version 4)
UIInt32	nDateTime	Mac Date Time Seconds from Jan 1,1904
SIInt32	nV1Extent	Header Bytes extension (Version 4 is +62 Bytes Till Data)

-Following is the added info for versions 2 to latest

SIInt16	nCsaKind	Type of CrossSpectra Data
SIInt32	nV2Extent	Header Bytes extension (Version 4 is +56 Bytes Till Data)

- Following is the added info for versions 3 to latest

char4	nSiteCodeName	Four character Site Code 'site'
SIInt32	nV3Extent	Header Bytes extension (Version 4 is +48 Bytes Till Data)

-Following is the added info for versions 4 to latest

SIInt32	nAverMinutes	Coverage Time in minutes for the data. 'Cross Spectra #' is normally 5minutes (4.5 rounded) 'CSS' is normally 15minutes 'CSA' is normally 60minutes
SIInt32	bDeleteCSWhenUsed	Was the 'Cross Spectra #' deleted by CSRAvvn when 'CSS' made.
SIInt32	bOverrideHeaderInfo	Did CPro use its own preferences to store sweep settings.
Float	fStartFreqMHz	Transmit Start Freq in MHz
Float	fRepFreqHz	Transmit Sweep Rate in Hz
Float	fBandwidthKHz	Transmit Sweep bandwidth in kHz
SIInt32	bSweepUp	Transmit Sweep Freq direction is up if non zero, else down NOTE: CenterFreq is fStartFreqMHz + fBandwidthKHz/2 * - 2^(bSweepUp==0)
SIInt32	nDopplerCells	Number of Doppler Cells (normally 512)
SIInt32	nRangeCells	Number of RangeCells (normally 32 for 'Cross Spectra #', 31 for 'CSS' or 'CSA')
SIInt32	nFirstRangeCell	Index of First Range Cell in data from zero at the receiver. 'Cross Spectra #' files normally use zero 'CSS' or 'CSA' files normally use one because CSRAvnn cuts off the first range cell as meaningless.
Float	fRangeCellDistKm	Distance between range cells in kilometers
SIInt32	nV4Extent	Header Bytes extension (Version 4 is +0 Bytes Till Data) Normally the cross spectra data follows, but if this file were version 5 or greater then the nV4Extent would tell you how many more bytes to skip until the data.
UIInt8	Extra	nV4Extent bytes of extra header data. (On version4, this is zero)

-End of Header Section

-Begin Data Section:

Repeat For 1 to *nRangeCells*

Antenna1 voltage squared amplitude float array of *nDopplerCells* length.

Antenna2 voltage squared amplitude float array of *nDopplerCells* length.

Antenna3 voltage squared amplitude float array of *nDopplerCells* length.

*(Note that some Antenna3 amplitude values may be negative to indicate noise or interference at those doppler bins. These negative values should be **absoluted** before use.)*

Antenna1 to Antenna2 cross spectra complex array of *nDopplerCells* length.

Antenna1 to Antenna3 cross spectra complex array of *nDopplerCells* length.

Antenna2 to Antenna3 cross spectra complex array of *nDopplerCells* length.

if *nCsaKind* is 2 then

Spectra quality float array of *nDopplerCells* length from zero to one in value.

End Repeat

End File

Note to convert Antenna1,2,3 to dBm use:

$10 \cdot \log_{10}(\text{abs}(\text{voltagesquared})) + (40.0 - 5.8)$

The 40.0 is an adjustment to conversion loss in the receiver.

The 5.8 is an adjustment to processing gain in SeaSondeAcquisition.