Supporting Information

An Expedient Approach for the Synthesis of Trispiropyrrolidine Bisoxindoles through 1,3-Dipolar Cycloaddition Reactions

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Shijiazhuang 050000, China

1. Crystallographic Data for **2j** and **2m** have been deposited at the Cambridge Crystallographic Data Centre, with the deposition numbers CCDC 990407 **2j** and CCDC 990408 **2m**.

Figure S1. Packing diagram of the compound **2j** and dashed lines depict hydrogen bonds

Figure S2. Packing diagram of the compound **2m** and dashed lines depict hydrogen bonds

2. **General Procedure for the Preparation of Trispiropyrrolidine Bisoxindoles 2a-2m:** A stirred mixture of 3-aryl-5-arylmethylenespiro[indole-3',2-[1,3]thiazolane]-2'(1*H*),4-dione **1** (1.0 mmol), isatin (1.2 mmol) and sarcosine (1.2 mmol) in toluene (20 mL) was heated under reflux condition for the specified period of time. After completion of the reaction as indicated by TLC analysis, the mixture was allowed to cool to room temperature and the solvent was evaporated under reduced pressure. The crude product was subjected to column chromatography using dichloromethane : petroleum ether (1:1) as eluent to afford the pure product **2a-2m**.

The ^1H and ^{13}C NMR spectra of **2a-2m**:

2b ¹H NMR

2b ¹³C NMR

1H NMR Spectrum Data (Chemical Shifts in ppm):

Chemical Shift (ppm)
10.790
10.340
7.603
7.518
7.462
7.464
7.354
7.122
7.065
7.066
6.926
6.911
6.982
6.933
6.817
6.814
5.799
4.379
4.461
3.884
3.866
3.822
3.644
3.447
3.446
2.992
2.992
2.278
2.251
2.251
2.251
2.111
1.294
1.116
1.100
1.000

Acquisition Parameters:

Parameter	Value
NAME	2013.04.22
EXPNO	3
PROCNO	1
Date_	20130422
Time	9.41
INSTRUM	spect
PROBHD	5 mm PABBO BB-
PULPROG	zg30
TD	32768
SOLVENT	DMSO
NS	8
DS	0
SWH	7500.000 Hz
FIDRES	0.228882 Hz
AQ	2.1845834 sec
RG	181
DW	66.667 usec
DE	6.50 usec
TE	295.0 K
DL	1.00000000 sec
TD0	1

Channel f1 Parameters:

Parameter	Value
NUC1	1H
PI	13.00 usec
PL1	2.00 dB
PL1W	16.79986763 W
SFO1	500.1330008 MHz
SF	32768
WDW	500.1300052 MHz
SSB	EM
LB	0.30 Hz
GB	0
PC	1.00

1H NMR spectrum of compound 10 in DMSO-d₆.

Chemical Shifts (ppm): 8.41, 8.37, 8.33, 8.29, 8.25, 8.21, 8.17, 8.13, 8.09, 8.05, 8.01, 7.97, 7.93, 7.89, 7.85, 7.81, 7.77, 7.73, 7.69, 7.65, 7.61, 7.57, 7.53, 7.49, 7.45, 7.41, 7.37, 7.33, 7.29, 7.25, 7.21, 7.17, 7.13, 7.09, 7.05, 7.01, 6.97, 6.93, 6.89, 6.85, 6.81, 6.77, 6.73, 6.69, 6.65, 6.61, 6.57, 6.53, 6.49, 6.45, 6.41, 6.37, 6.33, 6.29, 6.25, 6.21, 6.17, 6.13, 6.09, 6.05, 6.01, 5.97, 5.93, 5.89, 5.85, 5.81, 5.77, 5.73, 5.69, 5.65, 5.61, 5.57, 5.53, 5.49, 5.45, 5.41, 5.37, 5.33, 5.29, 5.25, 5.21, 5.17, 5.13, 5.09, 5.05, 5.01, 4.97, 4.93, 4.89, 4.85, 4.81, 4.77, 4.73, 4.69, 4.65, 4.61, 4.57, 4.53, 4.49, 4.45, 4.41, 4.37, 4.33, 4.29, 4.25, 4.21, 4.17, 4.13, 4.09, 4.05, 4.01, 3.97, 3.93, 3.89, 3.85, 3.81, 3.77, 3.73, 3.69, 3.65, 3.61, 3.57, 3.53, 3.49, 3.45, 3.41, 3.37, 3.33, 3.29, 3.25, 3.21, 3.17, 3.13, 3.09, 3.05, 3.01, 2.97, 2.93, 2.89, 2.85, 2.81, 2.77, 2.73, 2.69, 2.65, 2.61, 2.57, 2.53, 2.49, 2.45, 2.41, 2.37, 2.33, 2.29, 2.25, 2.21, 2.17, 2.13, 2.09, 2.05, 2.01, 1.97, 1.93, 1.89, 1.85, 1.81, 1.77, 1.73, 1.69, 1.65, 1.61, 1.57, 1.53, 1.49, 1.45, 1.41, 1.37, 1.33, 1.29, 1.25, 1.21, 1.17, 1.13, 1.09, 1.05, 1.01, 0.97, 0.93, 0.89, 0.85, 0.81, 0.77, 0.73, 0.69, 0.65, 0.61, 0.57, 0.53, 0.49, 0.45, 0.41, 0.37, 0.33, 0.29, 0.25, 0.21, 0.17, 0.13, 0.09, 0.05, 0.01, -0.03, -0.07, -0.11, -0.15, -0.19, -0.23, -0.27, -0.31, -0.35, -0.39, -0.43, -0.47, -0.51, -0.55, -0.59, -0.63, -0.67, -0.71, -0.75, -0.79, -0.83, -0.87, -0.91, -0.95, -0.99, -1.03, -1.07, -1.11, -1.15, -1.19, -1.23, -1.27, -1.31, -1.35, -1.39, -1.43, -1.47, -1.51, -1.55, -1.59, -1.63, -1.67, -1.71, -1.75, -1.79, -1.83, -1.87, -1.91, -1.95, -1.99, -2.03, -2.07, -2.11, -2.15, -2.19, -2.23, -2.27, -2.31, -2.35, -2.39, -2.43, -2.47, -2.51, -2.55, -2.59, -2.63, -2.67, -2.71, -2.75, -2.79, -2.83, -2.87, -2.91, -2.95, -2.99, -3.03, -3.07, -3.11, -3.15, -3.19, -3.23, -3.27, -3.31, -3.35, -3.39, -3.43, -3.47, -3.51, -3.55, -3.59, -3.63, -3.67, -3.71, -3.75, -3.79, -3.83, -3.87, -3.91, -3.95, -3.99, -4.03, -4.07, -4.11, -4.15, -4.19, -4.23, -4.27, -4.31, -4.35, -4.39, -4.43, -4.47, -4.51, -4.55, -4.59, -4.63, -4.67, -4.71, -4.75, -4.79, -4.83, -4.87, -4.91, -4.95, -4.99, -5.03, -5.07, -5.11, -5.15, -5.19, -5.23, -5.27, -5.31, -5.35, -5.39, -5.43, -5.47, -5.51, -5.55, -5.59, -5.63, -5.67, -5.71, -5.75, -5.79, -5.83, -5.87, -5.91, -5.95, -5.99, -6.03, -6.07, -6.11, -6.15, -6.19, -6.23, -6.27, -6.31, -6.35, -6.39, -6.43, -6.47, -6.51, -6.55, -6.59, -6.63, -6.67, -6.71, -6.75, -6.79, -6.83, -6.87, -6.91, -6.95, -6.99, -7.03, -7.07, -7.11, -7.15, -7.19, -7.23, -7.27, -7.31, -7.35, -7.39, -7.43, -7.47, -7.51, -7.55, -7.59, -7.63, -7.67, -7.71, -7.75, -7.79, -7.83, -7.87, -7.91, -7.95, -7.99, -8.03, -8.07, -8.11, -8.15, -8.19, -8.23, -8.27, -8.31, -8.35, -8.39, -8.43, -8.47, -8.51, -8.55, -8.59, -8.63, -8.67, -8.71, -8.75, -8.79, -8.83, -8.87, -8.91, -8.95, -8.99, -9.03, -9.07, -9.11, -9.15, -9.19, -9.23, -9.27, -9.31, -9.35, -9.39, -9.43, -9.47, -9.51, -9.55, -9.59, -9.63, -9.67, -9.71, -9.75, -9.79, -9.83, -9.87, -9.91, -9.95, -9.99, -10.03, -10.07, -10.11, -10.15, -10.19, -10.23, -10.27, -10.31, -10.35, -10.39, -10.43, -10.47, -10.51, -10.55, -10.59, -10.63, -10.67, -10.71, -10.75, -10.79, -10.83, -10.87, -10.91, -10.95, -10.99, -11.03, -11.07, -11.11, -11.15, -11.19, -11.23, -11.27, -11.31, -11.35, -11.39, -11.43, -11.47, -11.51, -11.55, -11.59, -11.63, -11.67, -11.71, -11.75, -11.79, -11.83, -11.87, -11.91, -11.95, -11.99, -12.03, -12.07, -12.11, -12.15, -12.19, -12.23, -12.27, -12.31, -12.35, -12.39, -12.43, -12.47, -12.51, -12.55, -12.59, -12.63, -12.67, -12.71, -12.75, -12.79, -12.83, -12.87, -12.91, -12.95, -12.99, -13.03, -13.07, -13.11, -13.15, -13.19, -13.23, -13.27, -13.31, -13.35, -13.39, -13.43, -13.47, -13.51, -13.55, -13.59, -13.63, -13.67, -13.71, -13.75, -13.79, -13.83, -13.87, -13.91, -13.95, -13.99, -14.03, -14.07, -14.11, -14.15, -14.19, -14.23, -14.27, -14.31, -14.35, -14.39, -14.43, -14.47, -14.51, -14.55, -14.59, -14.63, -14.67, -14.71, -14.75, -14.79, -14.83, -14.87, -14.91, -14.95, -14.99, -15.03, -15.07, -15.11, -15.15, -15.19, -15.23, -15.27, -15.31, -15.35, -15.39, -15.43, -15.47, -15.51, -15.55, -15.59, -15.63, -15.67, -15.71, -15.75, -15.79, -15.83, -15.87, -15.91, -15.95, -15.99, -16.03, -16.07, -16.11, -16.15, -16.19, -16.23, -16.27, -16.31, -16.35, -16.39, -16.43, -16.47, -16.51, -16.55, -16.59, -16.63, -16.67, -16.71

2d ^1H NMR

2d ^{13}C NMR

2e ^1H NMR

2f ¹H NMR

2f ¹³C NMR

NAME 2013.05.15
EXPNO 12
PROCNO 1
Date_ 20130513
Time 16.58
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT DMSO
NS 4
DS 0
SWH 7500.000 Hz
FIDRES 0.228882 Hz
AQ 2.1845834 sec
RG 144
DW 66.667 usec
DE 6.50 usec
TE 294.6 K
D1 1.00000000 sec
TD0 1

----- CHANNEL f1 -----
HUCL 1H
F1 13.00 usec
PL1 2.00 dB
PL1W 16.79986763 W
SFO1 500.1330885 MHz
ZF1 32768
SF 500.1300053 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

BRUKER

NAME 2013.05.15
 EXPNO 13
 PROCNO 1
 Date 20130515
 Time 17.20
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 16384
 SOLVENT DMSO
 NS 269
 DS 0
 SWH 29761.904 Hz
 FIDRES 1.816522 Hz
 AQ 0.2753012 sec
 WC 2050
 DW 16.800 usec
 DE 6.50 usec
 TE 295.2 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.30 usec
 PL1 4.50 dB
 PL1W 33.60013869 W
 SFO1 125.7703643 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.78 dB
 PL13 17.78 dB
 PL2W 16.79986763 W
 PL12W 0.443921112 W
 PL13W 0.443931112 W
 SFO2 500.13200005 MHz
 S1 32768
 SF 125.7578130 MHz
 WDW EM
 SSB 0
 LB 2.00 Hz

2h ^1H NMR

2h ^{13}C NMR

Chemical shifts (ppm) listed on the right side of the spectrum:

- 7.472, 7.457, 7.442, 7.426, 7.410, 7.395, 7.379, 7.363, 7.347, 7.331, 7.315, 7.299, 7.283, 7.267, 7.251, 7.235, 7.219, 7.203, 7.187, 7.171, 7.155, 7.139, 7.123, 7.107, 7.091, 7.075, 7.059, 7.043, 7.027, 7.011, 6.995, 6.979, 6.963, 6.947, 6.931, 6.915, 6.899, 6.883, 6.867, 6.851, 6.835, 6.819, 6.803, 6.787, 6.771, 6.755, 6.739, 6.723, 6.707, 6.691, 6.675, 6.659, 6.643, 6.627, 6.611, 6.595, 6.579, 6.563, 6.547, 6.531, 6.515, 6.499, 6.483, 6.467, 6.451, 6.435, 6.419, 6.403, 6.387, 6.371, 6.355, 6.339, 6.323, 6.307, 6.291, 6.275, 6.259, 6.243, 6.227, 6.211, 6.195, 6.179, 6.163, 6.147, 6.131, 6.115, 6.099, 6.083, 6.067, 6.051, 6.035, 6.019, 6.003, 5.987, 5.971, 5.955, 5.939, 5.923, 5.907, 5.891, 5.875, 5.859, 5.843, 5.827, 5.811, 5.795, 5.779, 5.763, 5.747, 5.731, 5.715, 5.699, 5.683, 5.667, 5.651, 5.635, 5.619, 5.603, 5.587, 5.571, 5.555, 5.539, 5.523, 5.507, 5.491, 5.475, 5.459, 5.443, 5.427, 5.411, 5.395, 5.379, 5.363, 5.347, 5.331, 5.315, 5.299, 5.283, 5.267, 5.251, 5.235, 5.219, 5.203, 5.187, 5.171, 5.155, 5.139, 5.123, 5.107, 5.091, 5.075, 5.059, 5.043, 5.027, 5.011, 4.995, 4.979, 4.963, 4.947, 4.931, 4.915, 4.899, 4.883, 4.867, 4.851, 4.835, 4.819, 4.803, 4.787, 4.771, 4.755, 4.739, 4.723, 4.707, 4.691, 4.675, 4.659, 4.643, 4.627, 4.611, 4.595, 4.579, 4.563, 4.547, 4.531, 4.515, 4.499, 4.483, 4.467, 4.451, 4.435, 4.419, 4.403, 4.387, 4.371, 4.355, 4.339, 4.323, 4.307, 4.291, 4.275, 4.259, 4.243, 4.227, 4.211, 4.195, 4.179, 4.163, 4.147, 4.131, 4.115, 4.099, 4.083, 4.067, 4.051, 4.035, 4.019, 4.003, 3.987, 3.971, 3.955, 3.939, 3.923, 3.907, 3.891, 3.875, 3.859, 3.843, 3.827, 3.811, 3.795, 3.779, 3.763, 3.747, 3.731, 3.715, 3.699, 3.683, 3.667, 3.651, 3.635, 3.619, 3.603, 3.587, 3.571, 3.555, 3.539, 3.523, 3.507, 3.491, 3.475, 3.459, 3.443, 3.427, 3.411, 3.395, 3.379, 3.363, 3.347, 3.331, 3.315, 3.299, 3.283, 3.267, 3.251, 3.235, 3.219, 3.203, 3.187, 3.171, 3.155, 3.139, 3.123, 3.107, 3.091, 3.075, 3.059, 3.043, 3.027, 3.011, 2.995, 2.979, 2.963, 2.947, 2.931, 2.915, 2.899, 2.883, 2.867, 2.851, 2.835, 2.819, 2.803, 2.787, 2.771, 2.755, 2.739, 2.723, 2.707, 2.691, 2.675, 2.659, 2.643, 2.627, 2.611, 2.595, 2.579, 2.563, 2.547, 2.531, 2.515, 2.499, 2.483, 2.467, 2.451, 2.435, 2.419, 2.403, 2.387, 2.371, 2.355, 2.339, 2.323, 2.307, 2.291, 2.275, 2.259, 2.243, 2.227, 2.211, 2.195, 2.179, 2.163, 2.147, 2.131, 2.115, 2.099, 2.083, 2.067, 2.051, 2.035, 2.019, 2.003, 1.987, 1.971, 1.955, 1.939, 1.923, 1.907, 1.891, 1.875, 1.859, 1.843, 1.827, 1.811, 1.795, 1.779, 1.763, 1.747, 1.731, 1.715, 1.699, 1.683, 1.667, 1.651, 1.635, 1.619, 1.603, 1.587, 1.571, 1.555, 1.539, 1.523, 1.507, 1.491, 1.475, 1.459, 1.443, 1.427, 1.411, 1.395, 1.379, 1.363, 1.347, 1.331, 1.315, 1.299, 1.283, 1.267, 1.251, 1.235, 1.219, 1.203, 1.187, 1.171, 1.155, 1.139, 1.123, 1.107, 1.091, 1.075, 1.059, 1.043, 1.027, 1.011, 0.995, 0.979, 0.963, 0.947, 0.931, 0.915, 0.899, 0.883, 0.867, 0.851, 0.835, 0.819, 0.803, 0.787, 0.771, 0.755, 0.739, 0.723, 0.707, 0.691, 0.675, 0.659, 0.643, 0.627, 0.611, 0.595, 0.579, 0.563, 0.547, 0.531, 0.515, 0.499, 0.483, 0.467, 0.451, 0.435, 0.419, 0.403, 0.387, 0.371, 0.355, 0.339, 0.323, 0.307, 0.291, 0.275, 0.259, 0.243, 0.227, 0.211, 0.195, 0.179, 0.163, 0.147, 0.131, 0.115, 0.099, 0.083, 0.067, 0.051, 0.035, 0.019, 0.003.

BRUKER

NAME 2013.05.24
 EXPNO 30
 PROCNO 1
 Date 20130524
 Time 21.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 16384
 SOLVENT DMSO
 NS 647
 DS 0
 SWH 29761.904 Hz
 FIDRES 1.816522 Hz
 AQ 0.2753012 sec
 RG 2050
 LW 16.800 usec
 DE 6.50 usec
 TE 298.3 K
 O1 2.00000000 sec
 O11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.30 usec
 PL1 4.50 dB
 PL1W 33.60015869 W
 SFO1 125.7703643 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 ECPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.78 dB
 PL13 17.78 dB
 PL2W 16.79986763 W
 PL12W 0.44392112 W
 PL13W 0.44392112 W
 SFO2 500.1320005 MHz
 SI 32768
 SF 125.7578130 MHz
 WSW EM
 SSB 0
 LB 2.00 Hz
 GB 0
 PC 1.40

2j ^1H NMR

2j ^{13}C NMR

BRUKER

NAME 2013.05.25
 EXPNO 6
 PROCNO 1
 Date_ 20130525
 Time 10.23
 INSTRUM spect
 PROBRD 5 mm PARBO HB-
 PULPROG zg30
 TD 32768
 SOLVENT DMSO
 NS 16
 DS 0
 SWH 7500.000 Hz
 FIDRES 0.228882 Hz
 AQ 2.1845834 sec
 RG 203
 DW 66.667 usec
 DE 6.50 usec
 TE 298.0 K
 D1 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 13.00 usec
 PL1 2.00 dB
 PL1W 16.79986763 W
 SFO1 500.1330885 MHz
 SI 32768
 SF 500.1300053 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

7.519
7.518
7.504
7.495
7.485
7.472
7.457
7.442
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5.745
5.725
5.705
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4.765
4.745
4.725
4.705
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4.665
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4.625
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4.525
4.505
4.485
4.465
4.445
4.425
4.405
4.385
4.365
4.345
4.325
4.305
4.285
4.265
4.245
4.225
4.205
4.185
4.165
4.145
4.125
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3.925
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3.885
3.865
3.845
3.825
3.805
3.785
3.765
3.745
3.725
3.705
3.685
3.665
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0.525
0.505
0.485
0.465
0.445
0.425
0.405
0.385
0.365
0.345
0.325
0.305
0.285
0.265
0.245
0.225
0.205
0.185
0.165
0.145
0.125
0.105
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12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm

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```

NAME                2013.05.31
EXPNO                1
PROCNO              1
Date_               20130531
Time_               9.15
INSTRUM             aspect
PROBHD              5 mm PABBO BB-
PULPROG             zgpg30
TD                  16384
SOLVENT             DMSO
NS                   1958
DS                   0
SWH                  29761.904 Hz
FIDRES              1.816522 Hz
AQ                   0.2753012 sec
RG                   2050
DW                   16.800 usec
DE                   6.50 usec
TE                   296.9 K
D1                   2.00000000 sec
D11                  0.05000000 sec
TDO                  1

===== CHANNEL f1 =====
NUC1                 13C
P1                   12.30 usec
PL1                  4.50 dB
PL1W                 33.60013869 W
SFO1                 125.7703643 MHz

===== CHANNEL F2 =====
CPDPRG2             waltz16
NUC2                 1H
PCPD2               80.00 usec
PL2                  2.00 dB
PL12                 17.78 dB
PL13                 17.78 dB
PLZW                16.79986763 W
PL12W               0.44392112 W
PL13W               0.44392112 W
SFO2                 500.1320005 MHz
SI                   32768
SF                  125.7578519 MHz
WDW                  EM
SGB                  0
LB                   1.00 Hz
GB                   0
PC                   1.40
  
```


21 ¹H NMR

21 ¹³C NMR

[illegible]

BRUKER

NAME 2014.01.13
 EXPRO 5
 PROCNO 1
 Date_ 20140114
 Time_ 9.36
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 16384
 SOLVENT DMSO
 NS 1024
 DS 4
 SWH 29761.904 Hz
 FIDRES 1.816522 Hz
 AQ 0.2753012 sec
 RG 2050
 DW 16.800 usec
 DE 6.50 usec
 TE 298.0 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 12.30 usec
 PL1 4.50 dB
 PL1W 33.60015869 W
 SFO1 125.7703643 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 80.00 usec
 PL2 2.00 dB
 PL12 17.78 dB
 PL13 17.78 dB
 PL2W 16.79986763 W
 PL12W 0.44392112 W
 PL13W 0.44392112 W
 SFO2 500.1320005 MHz
 S1 32768
 SFO 125.7577890 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 SC 1.00