

Technical Notification

Document number: 95-126918

Date: December – 2007

Thrane & Thrane Vehicular BGAN Terminal, TT-3712A Explorer 527 DD1494 Information

Subject:

This technical notification covers more in depth information on the Explorer 527 than is found in the Operator's manual. This information can be used when considering using the BGAN around other communication systems that may be affected by radiation being emitted from the Thrane E527 BGAN terminal.

Priority:

- **LOW:** For information purposes only – no direct action needed!

Continued....

Identification:

This document has more detailed information than was previously available describing characteristics of the Transmitter, Receiver and the Antenna for the vehicular BGAN terminal. The links below will direct you to the information you are seeking.

Action:

Select the link to that particular area that you would like to review information about on the system or you can scroll through the entire document until you get to the section/material you wish to review.

[TRANSMITTER EQUIPMENT CHARACTERISTICS](#)

[RECEIVER EQUIPMENT CHARACTERISTICS](#)

[ANTENNA EQUIPMENT CHARACTERISTICS](#)

[MEASURED PULSE CHARACTERISTICS \(PLOTS\)](#)

[HARMONIC LEVEL](#)

Thrane & Thrane
After Sales Service

Author:	Date:	Checked:	Date:	Approved:	Date:
<CKM>	20-11-2007	CK	21-12-2007	CK/RSB	03-01-2008

TRANSMITTER EQUIPMENT CHARACTERISTICS	
1. MANUFACTURER'S MODEL NO. Explorer™ 527 BGAN System, TT-3734A	2. MANUFACTURER'S NAME Thrane & Thrane
3. TRANSMITTER INSTALLATION Land Mobile Platform	4. TRANSMITTER TYPE Commercial Satcom
5. TUNING RANGE 1626.5–1660.5 MHz	6. METHOD OF TUNING Phased Locked Loop. Automatically Adjusted Crystal Synthesizer.
7. RF CHANNELING CAPABILITY: 1626.5MHz, 1.25kHz increments, channel bandwidth dynamic from 10.5kHz to 200kHz.	8. EMISSION DESIGNATOR(S) 16QAM; 37K1D1W, 74K1D1W, 167KD1W. Pi/4 QPSK; 18K5G1D, 37K1G1D, 74K1G1D, 167KG1D
9. FREQUENCY TOLERANCE $\leq \pm 0.09$ [ppm] (equals ± 150 [Hz])	
10. FILTER EMPLOYED (X one) ☒ a. YES ☐ b. NO	
11. SPREAD SPECTRUM (X one) ☐ a. YES ☒ b. NO	12. EMISSION BANDWIDTH (See remarks page 5) ☐ CALCULATED ☒ MEASURED
13. MAXIMUM BIT RATE 128kbps streaming or 464kbps background.	a. -3 db b. -20 db
14. MODULATION TECHNIQUES AND CODING TX: 16-QAM: 33600 to 151200 Symbols/second. Pi/4 QPSK: 16800 to 151200 Symbols/second. RX: 16-QAM: 33600 to 151200 Symbols/second. QPSK: 8400 to 33600 Symbols/second. All Turbo Coding, 25% root raised cosine roll-off.	c. -40 db d. -60 db e. OC-BW
15. MAXIMUM MODULATION FREQUENCY 151.2 kHz	
16. PRE-EMPHASIS (X one) ☐ a. YES ☒ b. NO	17. DEVIATION RATIO NA
18. PULSE CHARACTERISTICS (See plots page 6)	
19. POWER a. MEAN 17.5 dBW nominal max EIRP b. PEP 22.0 dBW	a. RATE 200 pulses and 50 pulses. b. WIDTH 4.77ms and 19.80ms c. RISE TIME 1.14µs.
20. OUTPUT DEVICE Class A/B LDMOS Transistor, Linear Amplifier.	d. FALL TIME 1.44µs. e. COMP RATIO NA.
21. HARMONIC LEVEL Complies to ETSI EN 301 444 v1.1.1	
22. SPURIOUS LEVEL Complies to ETSI EN 301 444 v1.1.1. Measured at antenna terminals.	a. 2ND -89.5dBc (see plot page 8). b. 3RD -84.5dBc (see plot page 8). c. OTHER -90.5dBc (6. harmonic) (see plot page 8).
23. FCC TYPE ACCEPTANCE NO. NA.	
24. REMARKS Block 10: Ceramic duplex filter, 60dB TX to RX isolation, 1dB insertion loss.	

RECEIVER EQUIPMENT CHARACTERISTICS				
1. MANUFACTURER'S MODEL NO. Explorer™ 527 BGAN System, TT-3734A		2. MANUFACTURER'S NAME Thrane & Thrane		
3. RECEIVER INSTALLATION Land Mobile Platform		4. RECEIVER TYPE Dual conversion, Super heterodyne, 16QAM and QPSK.		
5. TUNING RANGE 1525.0-1559.0 MHz		6. METHOD OF TUNING Phased Locked Loop. Automatically Adjusted C Synthesizer.		
7. RF CHANNELING CAPABILITY Frequency grid 1.25kHz increments, channel bandwidth dynamic from 10.5kHz to 189kHz		8. EMISSION DESIGNATOR(S) 16QAM; 42K0D1W, 84K0D1W, 200KD1W. QPSK; 21K0G1D, 42K0G1D, 84K0G1D, 200KG1D		
9. FREQUENCY TOLERANCE ≤ ±0.09 [ppm]				
10. IF SELECTIVITY	1ST	2ND	3RD	11. RF SELECTIVITY (X and complete as applicable)
a. -3 dB	1.26MHz	230kHz	NA	☒ CALCULATED ☐ MEASURED
b. -20 dB	See remarks	See remark	NA	a. -3 dB 40.5MHz (1516.3MHz to 1556.8MHz)
c. -60 dB	See remarks	See remark	NA	b. -20 dB 74.9MHz (1494.2MHz to 1569.1MHz)
				c. -60 dB 126.4MHz (1466.9MHz to 1593.3MHz).
12. IF FREQUENCY				d. PRESELECTION TYPE Ceramic Duplex Filters and Ceramic RX filters
a. 1ST 130.41MHz				13. MAXIMUM POST DETECTION FREQUENCY N/A
b. 2ND 0Hz				14. MINIMUM POST DETECTION FREQUENCY N/A
c. 3RD NA				
15. OSCILLATOR TUNED	1ST	2ND	3RD	16. MAXIMUM BIT RATE 128 kbps streaming or 464kbps background
a. ABOVE TUNED FREQUENCY			NA	17. SENSITIVITY
b. BELOW TUNED FREQUENCY	X		NA	a. SENSITIVITY -125 dBm @ antenna connector, remarks.
c. EITHER ABOVE OR BELOW FREQUENCY		X	NA	b. CRITERIA C/No = 40.1 dBHz
18. DE-EMPHASIS (X one)				c. NOISE FIG $10 \cdot \log(G/T) \geq -12.5 \text{ dB/K}$
☐ a. YES ☒ b. NO				d. NOISE TEMP N/A
19. IMAGE REJECTION -114dBc				20. SPURIOUS REJECTION N/A
21. REMARKS Block 10 item b and c, 1ST: Not specified at -20dB and -60dB. It is specified: -40dB (min) at 9.9MHz. Block 10 item b and c, 2ND: Not specified at -20 and -60dB, but specified at -40dB to 510kHz. Block 17 item a: -143dBW/m ² (global beam) with an antenna gain of 13dBi at 1542MHz gives -125dBm at the ant connector. Block 17 item b: Minimum C/No depends on the channel type. Global beam type F80T025Q1B sub-type L8 has the minimum requirement of only C/No=40.1dBHz.				

RECEIVER EQUIPMENT CHARACTERISTICS																			
1. MANUFACTURER'S MODEL NO. <i>TIM-4F Antaris GPS Receiver Module</i>			2. MANUFACTURER'S NAME u-blox AG, Zürcherstr. 68, CH-8800 Thalwil, Switzerland																
3. RECEIVER INSTALLATION <i>Land Mobile Platform</i>			4. RECEIVER TYPE Single Conversion, Spread Spectrum, Navstar GP Band																
5. TUNING RANGE Single Frequency GPS L1 Band: 1575.42 MHz			6. METHOD OF TUNING Fixed Crystal (23.104 MHz)																
7. RF CHANNELING CAPABILITY None			8. EMISSION DESIGNATOR(S) No Transmitter																
9. FREQUENCY TOLERANCE Local Osc 25 ppm (initial 7, temp 15, age 1p.a.)																			
10. IF SELECTIVITY	1ST	2ND	3RD	11. RF SELECTIVITY (X and complete as applicable) <table border="1"> <thead> <tr> <th></th> <th>CALCULATED</th> <th>MEASURED</th> </tr> </thead> <tbody> <tr> <td>a. -3 dB</td> <td></td> <td>X</td> </tr> <tr> <td>b. -20 dB</td> <td>20.6MHz (1564.6MHz to 1585.2MHz)</td> <td></td> </tr> <tr> <td>b. -20 dB</td> <td>34.1MHz (1558.3MHz to 1592.4MHz)</td> <td></td> </tr> <tr> <td>c. -60 dB</td> <td>81.1MHz (1518.1MHz to 1599.2MHz)</td> <td></td> </tr> </tbody> </table>		CALCULATED	MEASURED	a. -3 dB		X	b. -20 dB	20.6MHz (1564.6MHz to 1585.2MHz)		b. -20 dB	34.1MHz (1558.3MHz to 1592.4MHz)		c. -60 dB	81.1MHz (1518.1MHz to 1599.2MHz)	
	CALCULATED	MEASURED																	
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c. -60 dB	81.1MHz (1518.1MHz to 1599.2MHz)																		
a. -3 dB	5.3 MHz																		
b. -20 dB	20 MHz																		
c. -60 dB	60 MHz																		
12. IF FREQUENCY				d. PRESELECTION TYPE SAW Filter															
a. 1ST 96.764 MHz				13. MAXIMUM POST DETECTION FREQUENCY 1575.42 + 1023 kHz: 1576.443 MHz															
b. 2ND																			
c. 3RD				14. MINIMUM POST DETECTION FREQUENCY 1575.42 – 1023 KHz: 1574.397 MHz															
15. OSCILLATOR TUNED	1ST	2ND	3RD	16. MAXIMUM BIT RATE GPS Nav Message: 50 BPS															
a. ABOVE TUNED FREQUENCY																			
b. BELOW TUNED FREQUENCY	1478.656 MHz																		
c. EITHER ABOVE OR BELOW FREQUENCY				17. SENSITIVITY															
18. DE-EMPHASIS (X one) ☐ a. YES ☒ b. NO				a. SENSITIVITY -140dBm/-149dBm (Acquisition / Tracking)															
				b. CRITERIA Gold Code Correlation: C/No: 20 dBHz															
19. IMAGE REJECTION > 40dB (SAW Filter)				c. NOISE FIG 10dB															
				d. NOISE TEMP (2610K equivalent 10dB NF)															
20. SPURIOUS REJECTION not available (neglectable impact on performance)																			
21. REMARKS Block 1 : Imbedded in LV-10 antenna. Block 11: GPS module alone has -3dB BW of 40MHz and -20dB BW of 80MHz.																			

ANTENNA EQUIPMENT CHARACTERISTICS	
1. ☐ a. TRANSMITTING ☐ b. RECEIVING ☒ c. TRANSMITTING AND RECEIVING	
2. NOMENCLATURE, MANUFACTURER'S MODEL LV10 (Thrane model TT-3053A)	3. MANUFACTURER'S NAME SpaceCom (http://www.spacecom.dk)
4. FREQUENCY RANGE Transmit 1626.5–1660.5 MHz Receive 1525.0-1559.0 MHz	5. TYPE Helical antenna 1x4 linear array aligned in azimuth Each element Ø55mm. Ground plane L=44cm, B=12cm.
6. POLARIZATION Right-hand circular polarization (RHCP) ITU-R Recommendation 573	7. SCAN CHARACTERISTICS
8. GAIN	a. TYPE. Mechanical, search while track
a. MAIN BEAM 13dBi	b. VERTICAL SCAN
b. 1ST MAJOR SIDE LOBE SDM Vol.5, Ch.5, Table 2-1 +2dBi at +/-40° (Horizontal plane +5° elevation) +5dBi at +/-180° (Horizontal plane +60° elevation) -17dBi at +125° (Vertical plane +20° elevation)	(1) MAX ELEV +90°
	(2) MIN ELEV +5°
	(3) SCAN RATE 17°/s , 6.66 full scans/min. See remarks.
9. BEAMWIDTH	c. HORIZONTAL SCAN
a. HORIZONTAL 20° (+/-10°) (at +5° elevation). 40° (+/-20°) (at +60° elevation).	(1) SECTOR SCANNED 360°
b. VERTICAL 50° (at +20° elevation).	(2) SCAN RATE 120°/s , 6.66 full scans/min. See remarks.
	d. SECTOR BLANKING (X one) ☐ (1) YES ☒ (2) NO
10. REMARKS Block 7: The antenna only makes a sky scan at the beginning. Then it gets locked to the satellite and it track signal. The turn rate is 40°/s and the turn acceleration 50°/s ² mounted on a vehicle. The sky scan is making a full 360deg horizontal scan at 10deg fixed vertical position (duration 3 seconds for 360°). If the signal is not found, then the vertical position changes to 60deg fixed (duration 3 seconds) and another full 360deg horizontal scan is made (duration 3 second). A total of 9 seconds for a sky scan. When the signal is found, the elevation angle is optimized and the signal is being tracked.	

ANTENNA EQUIPMENT CHARACTERISTICS	
1. ☐ a. TRANSMITTING ☒ b. RECEIVING ☐ c. TRANSMITTING AND RECEIVING	
2. NOMENCLATURE, MANUFACTURER'S MODEL ANCP11G57SAA100	3. MANUFACTURER'S NAME Murata
4. FREQUENCY RANGE Receive 1574.42-1576.42 MHz	5. TYPE Half-wave ceramic patch antenna.
6. POLARIZATION RHCP	7. SCAN CHARACTERISTICS
8. GAIN	a. TYPE. Fixed
b.MAIN BEAM 2dBi	b. VERTICAL SCAN
b.1ST MAJOR SIDE LOBE None	(1) MAX ELEV NA
9. BEAMWIDTH	(2) MIN ELEV NA
b.HORIZONTAL 120°	(3) SCAN RATE NA
c.VERTICAL 120°	c. HORIZONTAL SCAN
	(3) SECTOR SCANNED NA
	(4) SCAN RATE. NA
	d. SECTOR BLANKING (X one) ☐ (1) YES ☒ (2) NO
10. REMARKS Block 1: GPS antenna imbedded in LV10	

Remarks:

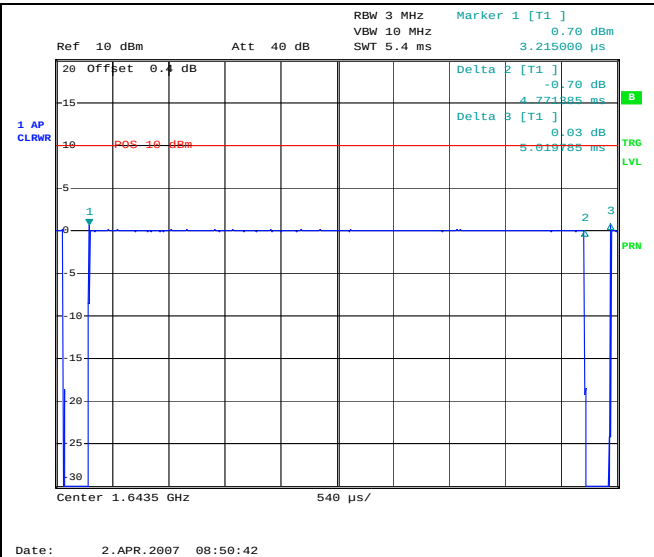
Page 1 Block 12: TX (Return bearer) Emission Bandwidth (Pi/4-QPSK and 16QAM):

[Symbols/Second]	-20dB	-25dB	-30dB	-45dB	Occupied Bandwidth (=99% BW)
16800 (=T0.5)	< 12kHz	< 14.9kHz	< 24.8kHz	< 50kHz	21kHz
33600 (=T1)	< 24kHz	< 29.8kHz	< 49.6kHz	< 100kHz	42kHz
67200 (=T2)	< 48kHz	< 59.6kHz	< 99.2kHz	< 200kHz	84kHz
151200 (=T4.5)	< 102kHz	< 134.1kHz	< 223.2kHz	< 450kHz	200kHz

Page 1 Block 18: Measured Pulse Characteristics

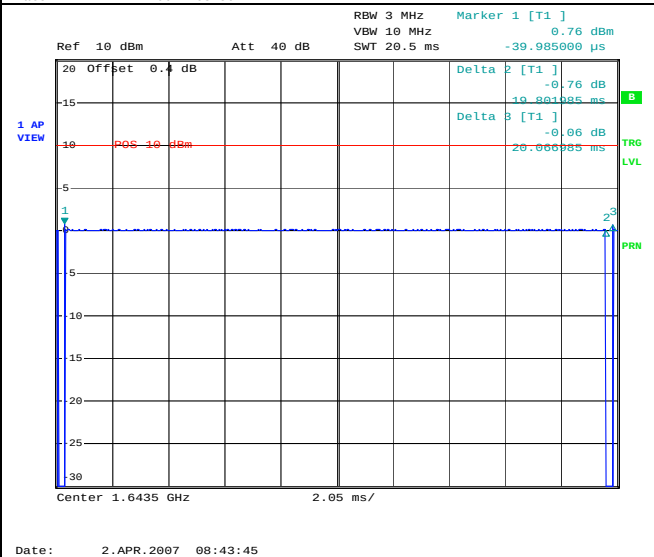
Rate: 200 pulses/second (5.02ms per cycle).
Width: 4.77ms.

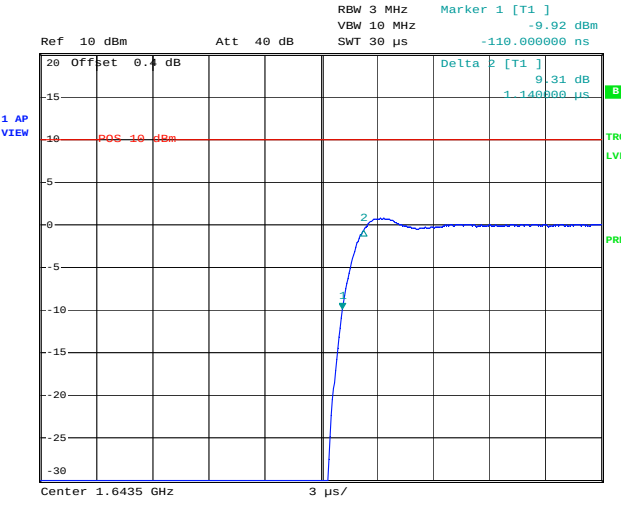
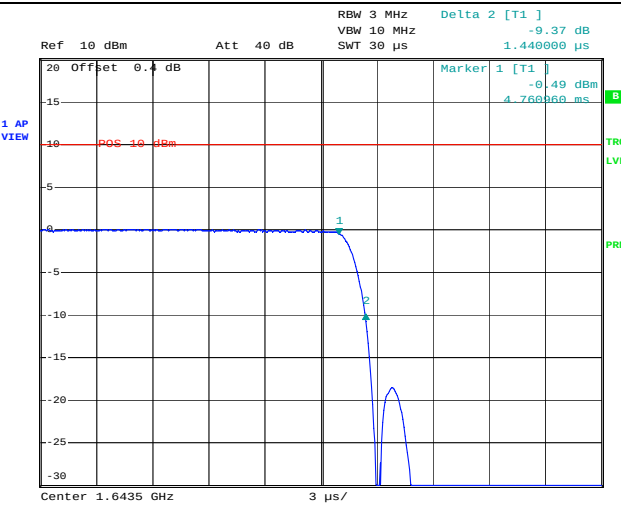
**Modulation type: R5T1X, R5T2X, R5T4.5X,
R5T2Q, R5T4.5Q.**



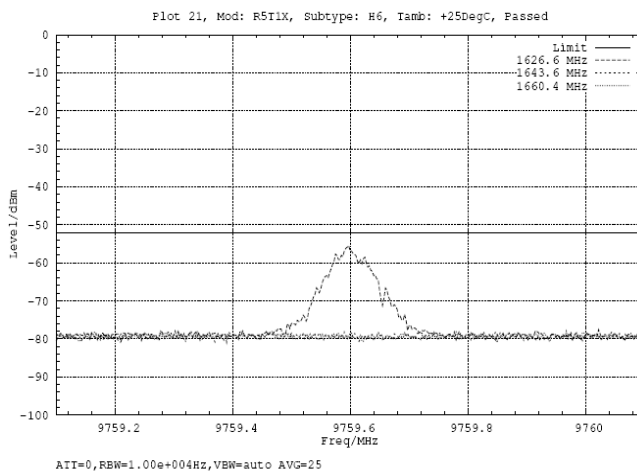
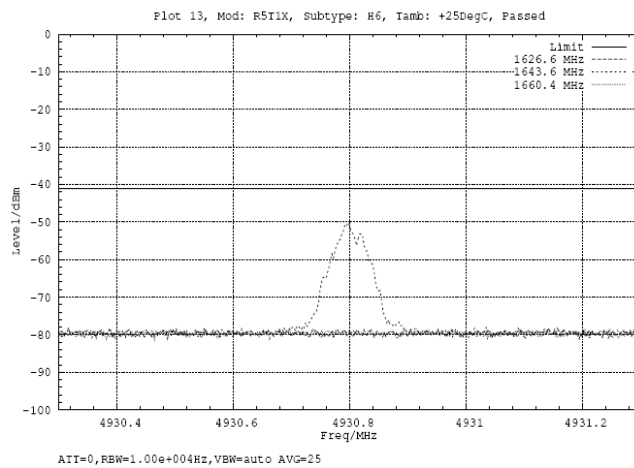
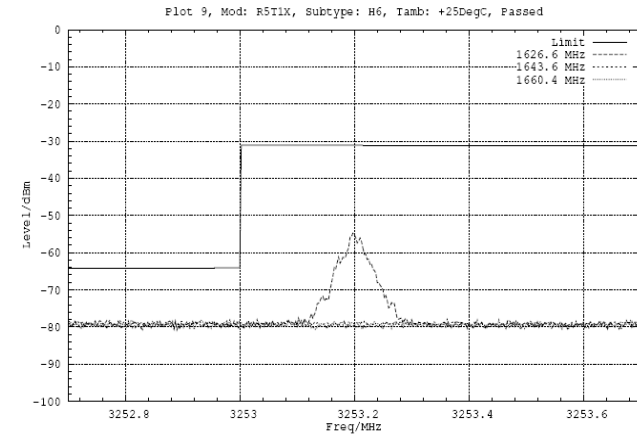
Rate: 50 pulses/second (20.07ms per cycle).
Width: 19.80ms.

**Modulation type: R20T1X, R20T2X,
R20T4.5X, R20T0.5Q, R20T1Q, R20T2Q,
R20T4.5Q.**



Rise time: 1.14μs 10% equals -10dB 90% equals -0.5dB Modulation type: R5T1X, R5T2X, R5T4.5X, R5T2Q, R5T4.5Q, R20T1X, R20T2X, R20T4.5X, R20T0.5Q, R20T1Q, R20T2Q, R20T4.5Q.	 Ref 10 dBm Att 40 dB RBW 3 MHz Marker 1 [T1] -9.92 dBm VBW 10 MHz Delta 2 [T1] 9.31 dB SWT 30 μs 1.140000 μs 1 AP VIEW Center 1.6435 GHz 3 μs/ Date: 2.APR.2007 08:15:13
Fall time: 1.44μs Modulation type: R5T1X, R5T2X, R5T4.5X, R5T2Q, R5T4.5Q, R20T1X, R20T2X, R20T4.5X, R20T0.5Q, R20T1Q, R20T2Q, R20T4.5Q.	 Ref 10 dBm Att 40 dB RBW 3 MHz Delta 2 [T1] -9.37 dBm VBW 10 MHz Delta 1 [T1] -9.49 dBm SWT 30 μs 1.440000 μs 1 AP VIEW Center 1.6435 GHz 3 μs/ Date: 2.APR.2007 08:17:11
Comp ratio:	N/A

Page 1 Block 21: Harmonic level. Carrier is 17.5dBW EIRP = 47.5dBm at antenna output. This equals 34.5dBm output at HPA. The Y-axis in the plots are in dBm and not dBc. To get from dBm to dBc subtract 34.5. Plot 9 below has peak power of -55dBm which equals -89.5dBc.



REMARKS

Additional information to the DD FORM 1494. The table refers to transmitter block 12 and 14 on page 1.

Emission Designators	Modulation	Symbol rate	Plot, file reference
37K1D1W	16QAM	33600	MTR_26_20060530144936_Bursts_001.txt/ MTR_26_20060530144936_Bursts_004.txt
74K1D1W	16QAM	67200	MTR_26_20060530144936_Bursts_002.txt/ MTR_26_20060530144936_Bursts_005.txt
167KD1W	16QAM	115200	MTR_26_20060530144936_Bursts_003.txt/ MTR_26_20060530144936_Bursts_006.txt
18K5G1D	Pi/4 QPSK	16800	MTR_26_20060530144936_Bursts_009.txt
37K1G1D	Pi/4 QPSK	33600	MTR_26_20060530144936_Bursts_010.txt
74K1G1D	Pi/4 QPSK	67200	MTR_26_20060530144936_Bursts_007.txt/ MTR_26_20060530144936_Bursts_011.txt
167KG1D	Pi/4 QPSK	151200	MTR_26_20060530144936_Bursts_008.txt/ MTR_26_20060530144936_Bursts_012.txt

