Generation of Test Signals for IS-136 (NADC) with Signal Generator SME

Application Note 1GPAN35E

A. Winter 07.96

Products:

Signal Generator SME

ROHDE&SCHWARZ

Introduction

Communication systems according to IS-136 (NADC) use Time Division Multiplex Access (TDMA) for the communication between base station and mobile stations. There are 6 time slots available. Depending on the amount of data, which have to be transmitted, the system uses full rate channels or half rate channels. A full rate channel means, that the mobile is accessed every 3rd time slot (e.g time slot 1 and 3, time slot 2 and 4 or time slot 3 and 6). With half rate channels the mobile is accessed every 6th time slot. Full rate and half rate channels may be mixed on demand.

The base stations transmit continous on their frequency. Depending on the used combination of full rate and half rate channels the base station uses a different sequence of synchronisation words. The mobile stations use bursted transmission with one of the synchronisation words S1 to S6 defined in the standard.

Signal Generator SME is excellently suited to generate these signals to test either base station receivers or mobile phone receivers. Together with the modulation data supplied with this application note the SME serves as a signal source for various test and measurement applications in the whole frequency range of IS-136 (NADC).

Downlink Signals (Base Station to Mobile Station)

In order to simulate a downlink signal, the SME is set to QPSK modulation according to the built in NADC standard. One of the supplied data sequences NADC_D1.SEQ to NADC_D8.SEQ may be used to modulate the SME.

These files contain the synchronisation words defined in the IS-136 (NADC) standard at the appropriate bit locations. The rest is filled with random data (See Appendix).

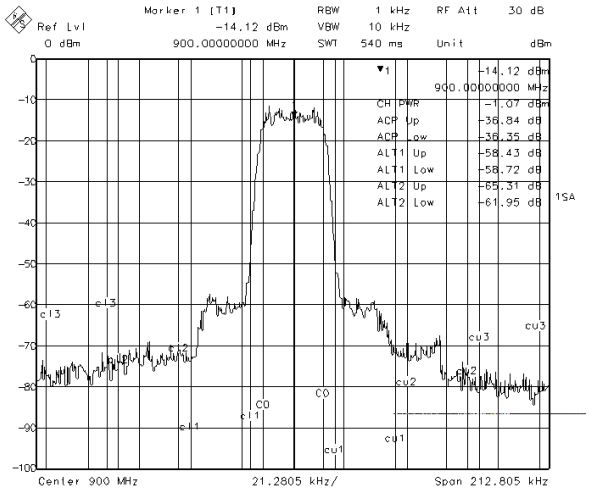
Use the supplied software SME-K1 to download one or more of these files into SME memory pool (Option SM-B11).

Now set the SME to the settings given below:

PRESET	
RF FREQ:	900 MHz or any other frequency
RF LEVEL	-6 dBm or any other level
DIGITAL MOD	QPSK
SOURCE	DATA
SELECT STAND.	NADC
SELECT LIST	NADC_D1 to NADC_D8

SME now sends a π/4DQPSK modulated continous signal at the set frequency and level.

The following plot was taken from a Spectrum Analyzer FSE. It shows the spectrum perfomance of SME generating such a downlink signal.



Unbursted Downlink Signal

Note: To get best results out of SME, adjust the generator according to the manual (see SME Operating Manual chapter 5.2.35 QPSK Modulation).

Uplink Signals (Mobile Station to Base Station)

Depending on the use of a full rate or a half rate channel, the mobile transmits every 3rd time slot (full rate) or every 6th time slot (half rate channel). Full rate channels use synchronisation word S1 to S3, half rate channels use synchronisation words S1 to S6.

In order to generate these bursted signals, the SME uses its Pulse Modulator Option. The pulse modulator is controlled by the BURST output signal.

To generate a burstet uplink signal, the SME has to be modulated with appropriate signals from the option DM Coder SM-B11. The DATA section of the SM-B11 data list contains the modulation data. If the modulated signal shall contain synchronisation words, they must be entered in this section. The burst amplitude is controlled in two ways. The LEV ATT section of SM-B11 controls the amplitude modulator in SME. This allows a linear reduction of the output amplitude by approximately 30 dB (you may enter a value of up to 60 dB in the menu item LEVEL ATTENUATION). In order to reduce the signal level by more than 80 dB, the option Pulse Modulator SM-B3 (for SME02, or SM-B8 and SM-B9 for

SME03 and SME06 respectively). The pulse modulator is controlled by the BURST section of the SM-B11 data list. For this the BURST output of SME has to be connected with the PULSE input of SME.

To generate bursted uplink signals you may use one of the supported files NAD_UF1.SEQ to NAD_UF6.SEQ, which will generate a full rate upplink signal (NAD_UF1 stands for NADC Uplink Full rate signal with synchronisation word S1 to S6).

If you want to generate halfrate signals, use one of the files NAD_UH1.SEQ to NAD_UH6.SEQ (NADC Uplink Half rate signal with synchronisation word S1 to S6).

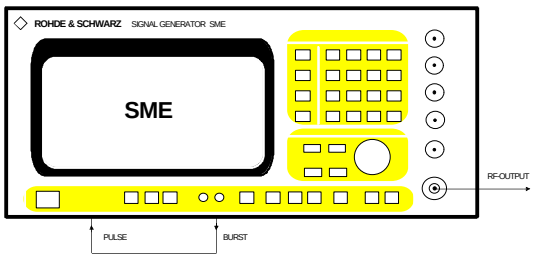
Use the supplied software SME-K1 to download one or more of these files to SME memory pool (Option SM-B11).

Then set the SME to the settings given below:

PRESET	
RF FREQ.	900 MHz or any other frequency
RF LEVEL	-6 dBm or any other level
DIGITAL MOD.	QPSK
SOURCE	DATA
LEVEL ATTEN.	60 dB
SELECT STAND.	NADC
SELECT LIST	NAD_UF1 to NAD_UF6 or NAD_UH1 to NAD_UH6
MODULATION	PULSE
SOURCE	EXT

You may use the supplied program IECCMD to make these settings automatically via IEEE-Bus (see Appendix). Use the batch file SET_NADC.BAT to set SME for this mode.

Connect the BURST output of SME to the PULSE input as shown in the next figure.

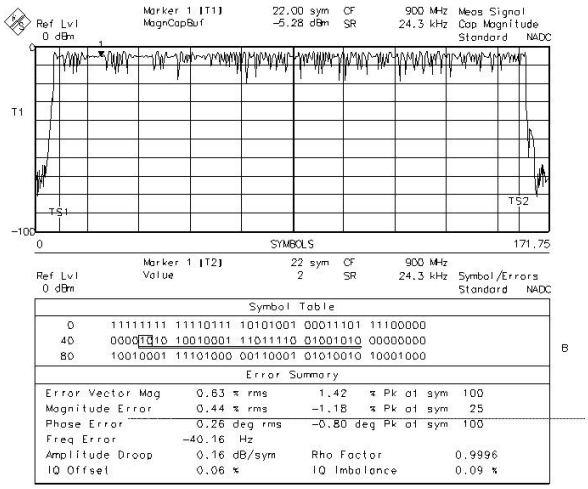


Cabling Scheme for SME Burst Signals

Note: Be sure to have the BURST output connected to the PULSE input, otherwise the output signal is supressed by the pulse modulator.

SME now sends a π/4DQPSK modulated **bursted** signal at the set frequency and level.

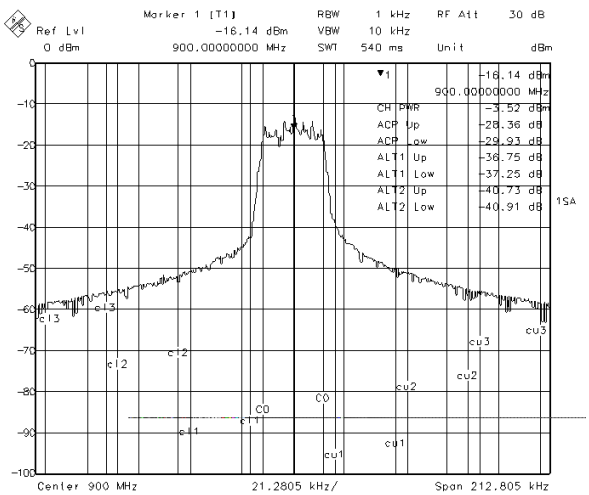
The next plot shows the power burst and the demodulated signal. This plot was taken from a Spectrum Analyzer FSE with Option Vector Analyzer FSE-B7.



Burst and Modulation Performance

Spectrum of Bursted Signals

The spectrum of the SME signal is of course affected by the amplitude burst. The next plot shows the burst spectrum measured with the Max Hold function of the FSE.



Burst spectrum

Applications, where high suppression of adjacent channel power is mandatory, must be treated as described below.

External Filter for Spectrum Shaping

The above settings give perfect modulation quality and bursts of correct length out of SME. Unfortunately the high switching speed of the SME amplitude modulator is too fast for this application. For the GSM system there is menu item GSM-SLOPE for the level attenuation mode, but this is not available for NADC.

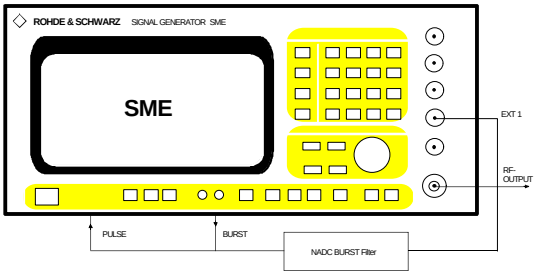
To overcome this, a solution for SME using an external filter for pulse shaping was developed.

This solution uses the capabilties of the SME having digital modulation and analog modulation active at the same time. The BURST output feeds an external filter, whose output signal controls the amplitude modulator via the external input EXT 1. By this, the SME RF output signal is attenuated by approximately 25 dB, before the Pulse Modulator switches off the signal. At the rising edge of the burst of course the Pulse Modu-lator must switch on the signal first to the attenuated level, before the amplitude modulator is driven to give the full power by the filter signal. This gives a reduc-tion of the switched spectrum of about 20 dB.

The Pulse Modulator cannot be controlled by the BURST output any more, since there must be certain delays. Therefore the BURST output now is fed into the Pulse Generator input (which is the same connetor at the SME rear panel). The Pulse Generator then controls the Pulse Modulator via internal connections.

The external filter is designed to match the power ramp requirements of the IS-136 (NADC) standard.

To set up SME for use with external filter, connect filter and SME as shown below.



Cabling Scheme for SME with external Filter SM-NADC

The fiter is a passive device, it does not need a power supply. The drawback of this is, that different modulation data than above described have to be used.

Modulation data for use with this filter are supplied in subdirectory NADC_FIL of software SME-K1. Change to this directory and download one or more of the files NAF_UF1.SEQ to NAF_UF6.SEQ (NADC for external Filter Uplink Full rate signal with synchronisation word S1 to S6).

To simulate half rate channel download one or more of the files NAF_UH1.SEQ to NAF_UH6.SEQ (NADC for external Filter Uplink Half rate signal with synchronisation word S1 to S6).

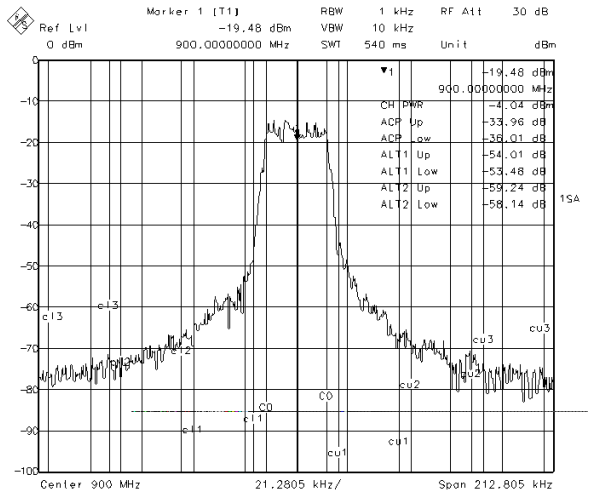
Then set the SME to the settings given below:

PRESET	
RF FREQ:	900 MHz or any other frequency
RF LEVEL	-6 dBm or any other level
DIGITAL MOD	QPSK
SOURCE	DATA
SELECT STAND.	NADC
SELECT LIST	NAD_UF1 to NAD_UF6 or NAD_UH1 to NAD_UH6
MODULATION	AM
AM DEPTH	90%
AM SOURCE EXT	EXT 1
AM EXT COUPLING	DC
AM POLARITY	INV
MODULATION	PULSE
SOURCE	PUSE-GEN
PERIOD	10.0 ms
WIDTH	6.66 ms
TRIGGER MODE	EXT
EXT TRIG SLOPE	NEG

Disregard any warnings which may occur during setup.

You may use the supplied program IECCMD to make these settings automatically via IEEE-Bus (see Appendix). Use the batch file SET_NADC.BAT to set SME for this mode.

The next plot shows the spectrum of SME using the external filter. As you can see, the performance reaches almost the high quality of an unbursted SME.



Bursted Signal with external Filter

Note: For best performance you have to readjust the SME according to the manual (see chapter 5.2.35 QPSK Modulation of the SME manual). This is neccessary because the QPSK modulator of the SME works at a different operating point of its characteristics when the Pulse modulator is on.

Adjacent Channel Power comparison:

The table below gives a comparison of the typical adjacent channel power levels which can be achieved with the different methods. The values are taken from the plots.

	No Burst	Burst with NADC Filter	Burst without Filter
Adj. Channel	-36 dB	-34 dB	-28 dB
Alt. Channel 1	-58 dB	-53 dB	-37 dB
Alt Channel 2	-62 dB	-58 dB	-40 dB

Ordering information for equipment used

The following list gives the ordering information for the respective equipment:

Designation	Type / Order No.
Signal Generator 9kHz to 1.5 GHz	SME 02 1038.6002.02
Signal Generator 9kHz to 3 GHz	SME 03 1038.6002.03
Signal Generator 9kHz to 3 GHz	SME 06 1038.6002.06
Required options	
Pulse Modulator for SME 02	SM-B3 1036.6340.02
Pulse Modulator for SME 03	SM-B8 1036.6805.02
Pulse Modulator for SME 06	SM-B9 1036.5100.02
Pulse Generator (for use with external filter only)	SM-B4 1036.9310.02
DM Coder	SME-B11 1036.8720.02
Further enhancements	
DM Memory Extension	SME-B12 1039.4090.02
External NADC- Filter	
NADC Burst Filter for SME	SM-NADC 1009.3571.02
Software	
Software for Generation and Transfer of Modulation Data to SME (reduced version enclosed with this Application Note, full version available on request)	SME-K1
Setting tool for IEC/IEEE bus (enclosed with this Application Note)	IECCMD.EXE

References

Lüttich, F.; Klier, J.: Signal Generator SME - The specialist for digital communications. News from Rohde & Schwarz (1993) No. 141, pp 4-7

Klier, J.: GSM propagation measurements with Signal Generator SME. News from Rohde & Schwarz (1994) No. 145, pp 36-37

Lainer, K.; Leutiger, M.; Schröder, D.: Testing ERMES pagers with Signal Generator SME. News from Rohde & Schwarz (1994) No. 145, pp 33-35

Klier, J.: Extensions to Signal Generator SME for testing new digital networks. News from Rohde & Schwarz (1994) No. 146, pp 40-41

SME with Optional DM Coder, Hints for Using the Data Generator. Application Note 1GPAN08.EXE

Appendix

Automatic Setting and Downloading Data Sequences to SME

For loading the modulation data into the memory of Signal Generator SME, a PC with IEC/IEEE-bus card and properly installed IEC/IEEE-bus software (driver GPIB.COM) is required. It is advisable to make the generator settings also via the IEC/IEEE bus.

Two small software packages are supplied with this Application Note for your convenience. The SME-K1 program is for loading the data memories of the signal generator while the IECCMD program is for setting the generator.

For installing these programs on the IEC/IEEE-bus controller proceed as follows:

SME-K1

The supplied software package SME-K1 is a reduced version, which contains only the data files for NADC. Contact R&S for the full version, if you also use other communication systems.

SME-K1 comprises the following files:

INSTALL .EXE	Installation file
SME___ .EX_	Program archive
SME_K1 .DOC	Documentation

It is installed on the hard disk with INSTALL.EXE. We recommend to use the directory SME, which may however be renamed. A subdirectory \NADC is created, which contains all NADC data sequences. Another subdirectory \NADC_FIL contains all files, which are used in combination with an external NADC Filter SM-NADC. The required hard disk capacity is approx. 300 kbyte.

After program installation connect the outputs and inputs of the Signal Generators SME as shown in the cabling schemes. Also connect the generator via IEC/IEEE-bus cable to the PC. Set SME to IEC/IEEE-bus address 28 (factory preset).

The modulation data can now be loaded into the generator. Change to directory SME and start the program SME-K1 by entering SME↵ on the PC. How to operate the program is described in file SME_K1.DOC. Change to the appropriate directory \NADC or \NADC_FIL with the Change Dir command from the File menu.

Load the desired data sequence into the program (press F3, then select the appropriate file *.SEQ) and transfer the data to SME (press ALT-T and ↵). You may download as many sequences as long as there is free memory in SME. Quit the program SME-K1 (press ALT-X).

IECCMD

The SME is set using the program IECCMD.EXE. To do this change to the directory which containes the appropriate files, start the batch file SET_NADC.BAT (without using external filter) and SET_NFIL.BAT respectivly (for using external filter) and follow the informations given at the screen of the PC.

First copy the IECCMDP.EXE file into a separate directory IECCMD or an other directory of your choice on the hard disk of the PC and run this file. This file is a packed file which is automatically unpacked upon startup and loads the following files into the current directory of the hard disk:

IECCMD .EXE	program file
IECCMD .TXT	doc. file for program
SME .CNF	configuration file
SET_NADC.BAT	sets SME for NADC
SET_NADC.IEC	contains NADC settings
SET_NFIL.BAT	sets SME for ext. filter
SET_NFIL.IEC	settings for external filter
SET_ADJF.BAT	for adjusting ext. filter
SET_ADJF.IEC	adjustment settings

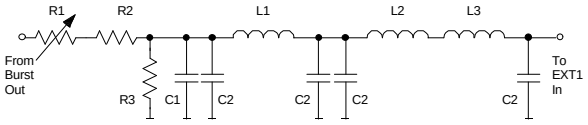
The required memory capacity is approx. 60 kbyte.

Now set SME by invoking the appropiate batch file SET_NADC.BAT, SET_NFIL.BAT or SET_ADJF.BAT at the DOS prompt.

Loading the modulation data and instrument settings into the generator has of course to be done only once. Data and settings remain stored when the generator is switched off.

NADC Filter

Below you find the schematics and component values of the external filter used.



Component values

R1	1kΩ	C1	1nF
R2	4.75kΩ	C2	1nF
R3	1.82kΩ	C3	8.2nF
L1	10mH	C4	820pF
L2	10mH	C5	18nF
L3	12mH		

This filter is available from Rohde&Schwarz (see ordering information).

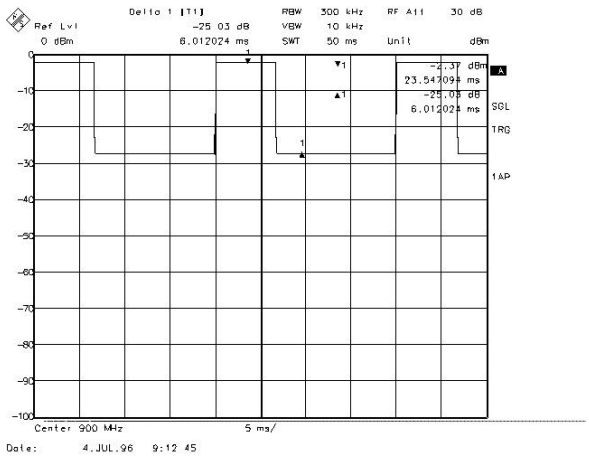
Adjusting the NADC Filter

The NADC filter is preadjusted in the factory. It should normally not be neccessary to readjust it. For best performance at your specific operating frequency however you may adjust the filter according to the procedure given here.

- Connect the NADC filter and set SME as described above.
- Set SME to the desired operating frequency at an output level of -2 dBm.
- Connect a spectrum analyzer to the SME output.
- Load the sequence ADJUST_F.SEQ into SME memory pool. This file contains a DATA sequence of zero´s, which gives a constant amplitude output with π/4DQPSK modulation. The BURST information of this file controls the amplitude modulation.
- Switch off Pulse Modulation of SME (MODULATION / PULSE / SOURCE OFF).
- Set the spectrum analyzer to following settings:

Center Freq.	same as SME
Span	zero span
RF bandwidth	300 kHz
Video bandwith	10 kHz
Sweep time	50 ms

- Adjust the variable resistor in the filter for a level attenuation of 25 dB. You should obtain a spectrum analyzer display similar to the following picture:



- Return SME to normal settings.

Maximum Output Level

The output level of SME is 13 dBm with an unspecified overrange to 16 dBm when generating an unmodulated signal. As filtered QPSK modulation as it is used with IS-136 (NADC) shows a certain amount of amplitude modulation, the maximum output level is reduced by 3.23 dB. If the Pulse Modulator is used, the level is reduced another 3 dB to 5 dB (3 dB for SME02, 4 dB for SME03 and 5 dB for SME06). External Amplitude modulation normally needs another 6 dB of level reduction. The SME takes into account all of these settings and gives a warning, when the output level is set to a value, which might exceed the save limits of 13 dBm -3.2 dB (QPSK) -3 dB (Puls Modulator in SME02, 4 db for SME03 and 5 dB for SME06 respectivly) - 6 dB (external Amplitude Modulation). If you set an output level higher than +0.8 dBm, you will get a warning message on the SME display. As the external Amplitude Modulation is used to reduce the output level of the SME only, the 6 dB margin for this is not neccessary. Despite of the warning you can use an output level of up to 6.8 dBm (5.8 dBm with SME03 and 4.8 dBm with SME06). With the use of overrange the maximum output level is 9.8 dBm (8.8 dBm and 7.8 dBm respectivly).

Firmware and Hardware Requirements for SME

This application works with SME Firmware Rev. 3.12 and up.

SME has to be equipped with SM-B11 Rev 3 (Var 4) or newer.

Supplied SME-K1 Data Files and Synchronisation Words

The supplied data files are part of the software SME-K1. There is a subdirectory NADC, which contains files for unburstet signals and bursted signals without external filter. Another subdirectory NADC_FIL contains data files for bursted signals for use with external filter SM-NADC.

Subdirectory NADC of SME-K1

The files NADC_D1.SEQ to NADC_D7.SEQ simulate downlink signals from the base station to the mobile.

The Sync Words begin at bit positions 1, 325, 649, 973, 1297 and 1621 (bits counted from 1 up as used in SME-K1).

The files NAD_UF1.SEQ to NAD_UF6.SEQ simulate a full rate uplink signal (mobile to base station). The synchronisation words S1 to S6 begin at DATA bit 29. The bits in LEV ATT and BURST are adjusted to give the correct burst length.

The sequences are 3 time slots long, so the signal is repeated in time slots 4 to 6.

NAD_UH1.SEQ to NAD_UH6.SEQ are the same, but simulating a half rate channel. This means, these sequences are 6 time slots long.

The following tables show the usage of the Sync Words in the supplied files.

Downlink signals

	Time Slots					
File	1	2	3	4	5	6
NADC_D1.SEQ	1	2	3	4	5	6
NADC_D2.SEQ	1	2	3	1	5	6
NADC_D3.SEQ	1	2	3	4	2	6
NADC_D4.SEQ	1	2	3	4	5	3
NADC_D5.SEQ	1	2	3	1	2	6
NADC_D6.SEQ	1	2	3	1	5	3
NADC_D7.SEQ	1	2	3	1	4	3
NADC_D8.SEQ	1	2	3	1	2	3

Full rate uplink signals

	Time Slots					
File	1	2	3	4	5	6
NAD_UF1.SEQ	1	-	-	1	-	-
NAD_UF2.SEQ	2	-	-	2	-	-
NAD_UF3.SEQ	3	-	-	3	-	-
NAD_UF4.SEQ	4	-	-	4	-	-
NAD_UF5.SEQ	5	-	-	5	-	-
NAD_UF6.SEQ	6	-	-	6	-	-

Half rate uplink signals

	Time Slots					
File	1	2	3	4	5	6
NAD_UH1.SEQ	1	-	-	-	-	-
NAD_UH2.SEQ	2	-	-	-	-	-
NAD_UH3.SEQ	3	-	-	-	-	-
NAD_UH4.SEQ	4	-	-	-	-	-
NAD_UH5.SEQ	5	-	-	-	-	-
NAD_UH6.SEQ	6	-	-	-	-	-

Subdirectory NADC_FIL of SME-K1

The files NAF_U1F.SEQ to NAF_U6F.SEQ simulate a full rate uplink signal (mobile to base station) for use with external filter SM-NADC. The synchronisation words S1 to S6 begin at DATA bit 29. The bits in LEV ATT and BURST are adjusted to give the correct burst length.

The sequences are 3 time slots long, so the signal is repeated in time slots 4 to 6.

NAD_F1H.SEQ to NAF_U6H.SEQ are the same, but simulating a half rate channel. This means, these sequences are 6 time slots long.

The following tables show the usage of the Sync Words in the supplied files.

Full rate uplink signals

	Time Slots					
File	1	2	3	4	5	6
NAF_UF1.SEQ	1	-	-	1	-	-
NAF_UF2.SEQ	2	-	-	2	-	-
NAF_UF3.SEQ	3	-	-	3	-	-
NAF_UF4.SEQ	4	-	-	4	-	-
NAF_UF5.SEQ	5	-	-	5	-	-
NAF_UF6.SEQ	6	-	-	6	-	-

Half rate uplink signals

	Time Slots					
File	1	2	3	4	5	6
NAF_UH1.SEQ	1	-	-	-	-	-
NAF_UH2.SEQ	2	-	-	-	-	-
NAF_UH3.SEQ	3	-	-	-	-	-
NAF_UH4.SEQ	4	-	-	-	-	-
NAF_UH5.SEQ	5	-	-	-	-	-
NAF_UH6.SEQ	6	-	-	-	-	-

The file ADJ_F.SEQ may be used to adjust the NADC filter. The DATA bits in this file are set to all zeroe´s, this gives a constant amplitude signal (with a frequency offset od course) which helps in adjusting the level attenuation.

List of Setting Commands for SME

Bursted and Unburstet Signals

The batch program SET_NADC.BAT is used to set SME to generate bursted NADC uplink signals. It is supposed, that the data list NAD_UF1.SEQ was downloaded to SME using SME-K1. The batch program invokes the program IECCMD.EXE. The SME settings are stored in the file SET_NADC.IEC, whose listing is given below.

To generate unbursted downlink signals use the same settings, download NADC_D1.SEQ e.g. to SME and select this list manually.

```
PRINT:
PRINT:**************************************************************************
PRINT:    Automatic settings for SME via IEEE Bus (address 28!)
PRINT:    Application: IS-136 (NADC)
PRINT:    Rohde & Schwarz 7/96
PRINT:**************************************************************************
PRINT:
;
;Minimum requirements for the SME used:
;       Option DM Coder SME-B11
;       Option Pulse Modulator SM-B3 or SM-B8 or SM-B9
;
;-------- Reset for SME ----------
>SME1:*CLS
>SME1:*RST

;--- Settings for IS-136 (NADC), PRN data with sync pattern NADC S1
>SME1:FREQ 900 MHz
>SME1:POW -2

>SME1:TRIG:PULS:SOUR EXT

>SME1:DM:TYPE QPSK
>SME1:DM:QPSK:STAN ADC
>SME1:DM:DATA:ALEV 60
>SME1:DM:DATA:ALEV:MODE NORM
>SME1:DM:STATE ON

>SME1:SOUR:DM:DATA:SEL "NAD_UF1"
>SME1:DM:SOUR DATA

>SME1:PULM:EXT:IMP 10 kOhm
>SME1:PULM:SOURCE EXT
>SME1:PULM:POL NORM
>SME1:PULM:STATE ON

>SME1:OUTP ON
>SME1:AM:STAT OFF

;-----To save settings remove ";" in next line----
;>SME1:*SAV 49

;-------- Any errors on SME? ----------
<SME1:system:error?

COMPARE:0,"No error"

PRINT:
PRINT:**************************************************************************
PRINT:    Automatic settings for SME completed
PRINT:**************************************************************************
PRINT:

ECHO:ON

;-------- Goto Local SME ----------
PRINT:*** To return to local control press the 'local' key on the SME
```

Bursted Signals with external Filter

The batch program SET_NFIL.BAT is used to set SME to generate bursted NADC uplink signals with external filter SM-NADC. It is supposed, that the data list NAF_UF1.SEQ was downloaded to SME using SME-K1. The batch program invokes the program IECCMD.EXE. The SME settings are stored in the file SET_NFIL.IEC, whose listing is given below.

```
PRINT:
PRINT:*************************************************************************
PRINT:    Automatic settings for SME via IEEE Bus (address 28!)
PRINT:    Application: IS-136 (NADC) with external filter SM-NADC
PRINT:    Rohde & Schwarz 7/96
PRINT:*************************************************************************
PRINT:
;
;Minimum requirements for the SME used:
;       Option DM Coder SME-B11
;       Option Pulse Modulator SM-B3 or SM-B8 or SM-B9
;       Option Pulse Generator SM-B4

;-------- Reset for SME ----------
>SME1:*CLS
>SME1:*RST

;--- Settings for IS-136 (NADC), PRN data with sync pattern NADC S1

>SME1:FREQ 900 MHz
>SME1:POW -2

>SME1:TRIG:PULS:SOUR EXT

>SME1:DM:TYPE QPSK
>SME1:DM:QPSK:STAN ADC
>SME1:DM:DATA:ALEV 0
>SME1:DM:DATA:ALEV:MODE NORM
>SME1:DM:STATE ON

>SME1:SOUR:DM:DATA:SEL "NAF_UF1"

>SME1:PULM:EXT:IMP 10 kOhm
>SME1:PULM:SOURCE INT
>SME1:PULM:POL NORM
>SME1:PULM:STATE ON

>SME1:PULS:PER 10.0ms
>SME1:PULS:WIDT 6.66ms
>SME1:PULS:DEL 1us
>SME1:TRIG:PULS:SOUR EXT
>SME1:TRIG:PULS:SLOP NEG

>SME1:DM:SOUR DATA

>SME1:AM 90PCT
>SME1:AM:SOUR EXT
>SME1:AM:EXT:COUP DC
>SME1:AM:POL INV

>SME1:OUTP ON
>SME1:AM:STAT ON

;-----To save settings remove ";" in next line----
;>SME1:*SAV 49

;-------- Any errors on SME? ----------
<SME1:system:error?

COMPARE:0,"No error"

PRINT:
PRINT:*************************************************************************
PRINT:    Automatic settings for SME completed
PRINT:*************************************************************************
PRINT:
ECHO:ON
;-------- Goto Local SME ----------
PRINT:*** To return to local control press the 'local' key on the SME
```

Filter Adjustment

The batch program SET_ADJF.BAT is used for setting the external filter SM-NADC. It is supposed, that the data list ADJ_F.SEQ was downloaded to SME using SME-K1. The batch program invokes the program IECCMD.EXE. The SME settings are stored in the file SET_ADJF.IEC, whose listing is given below.

```
PRINT:
PRINT:**************************************************************************
PRINT:    Automatic settings for SME via IEEE Bus (address 28!)
PRINT:    Application: IS-136 (NADC) signal bursts,
PRINT:                 external filter adjustment
PRINT:    Rohde & Schwarz 7/96
PRINT:**************************************************************************
PRINT:

;-------- Reset for SME ----------
>SME1:*CLS
>SME1:*RST

>SME1:FREQ 900 MHz
>SME1:POW -2

;--- Settings for SME external filter adjustment

>SME1:AM 90PCT
>SME1:AM:EXT:COUP DC
>SME1:AM:POL INV

>SME1:DM:TYPE QPSK
>SME1:DM:QPSK:STAN ADC
>SME1:DM:DATA:ALEV 0
>SME1:DM:DATA:ALEV:MODE NORM
>SME1:DM:STATE ON

>SME1:SOUR:DM:DATA:SEL "ADJ_F"

>SME1:PULM:EXT:IMP 10 kOhm
>SME1:PULM:SOURCE INT
>SME1:PULM:STATE OFF

>SME1:DM:SOUR DATA

>SME1:AM:SOUR EXT; STAT ON

>SME1:OUTP ON

;-----To save settings remove ";" in next line----
;>SME1:*SAV 49

;-------- Any errors on SME? ----------
<SME1:system:error?

COMPARE:0,"No error"

PRINT:
PRINT:**************************************************************************
PRINT:    Automatic settings for SME completed
PRINT:**************************************************************************
PRINT:

ECHO:ON

;-------- Goto Local SME ----------
PRINT:*** To return to local control press the 'local' key on the SME
```