



# **SEMINARIO DE GRADUACIÓN**

## **REDES UMTS**

PROYECTO:

### ESTUDIO Y DISEÑO DE TRANSMISORES Y RECEPTORES PARA REDES UMTS

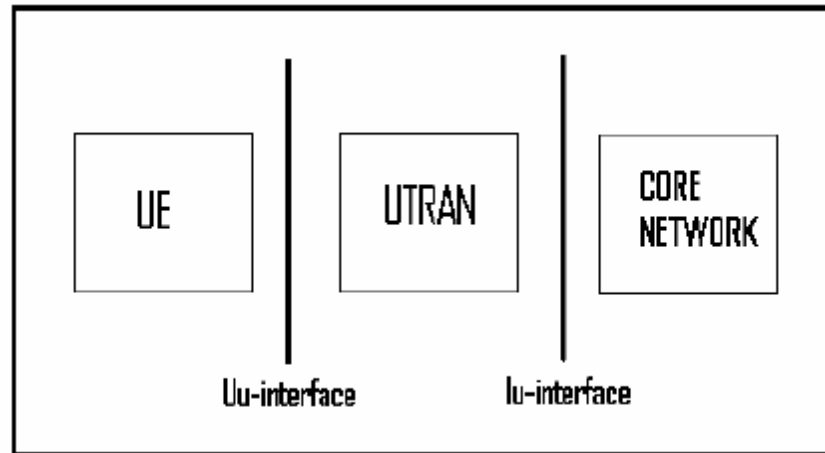
PRESENTADO POR:

**JOSÉ MANUEL AGUIRRE ÁLVAREZ**  
**LUIS ALFREDO CHÁVEZ GONZÁLEZ**

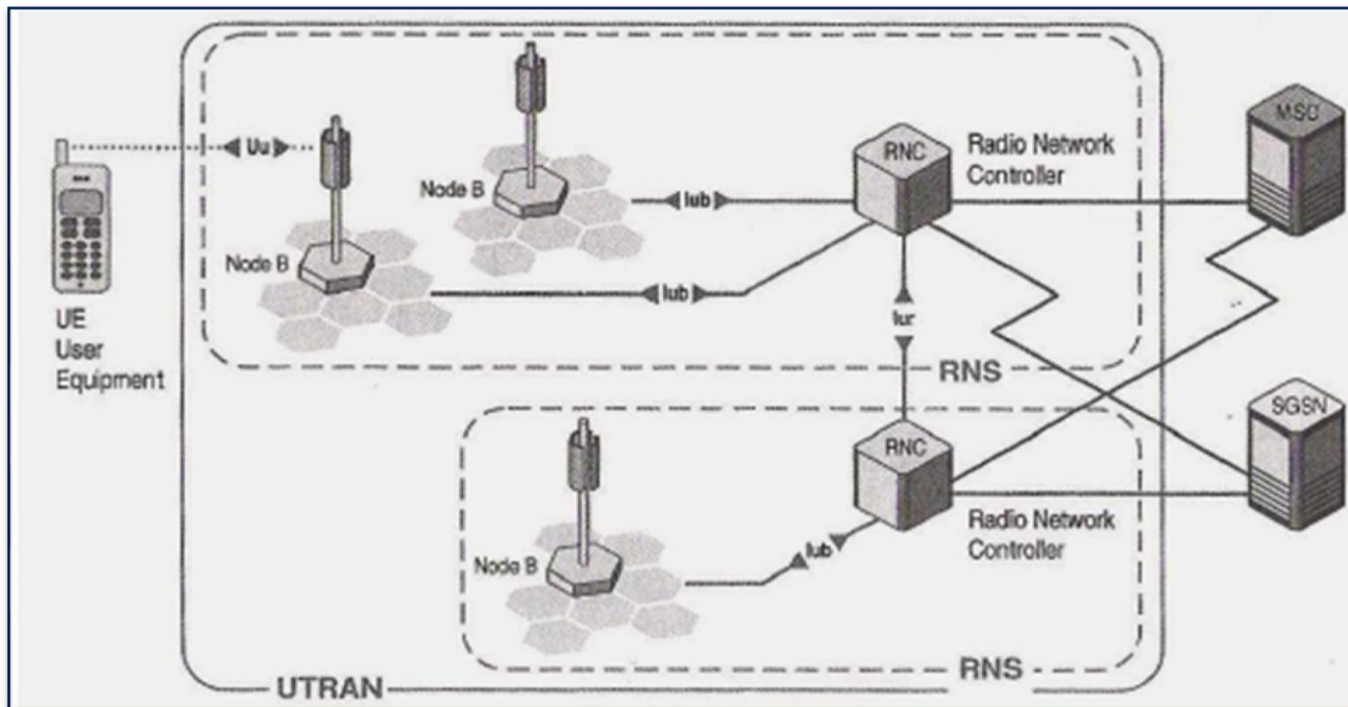
## Estructura de la red UMTS

- Equipo de usuario (UE).
- Interfaz Uu.
- Red de acceso de radio UMTS (UTRAN).
- Interfaz Iu.
- Red Central (CORE NETWORK).

- **UE** (Equipo de usuario)
- **UTRAN** (UMTS Terrestrial Radio Access Network)
- **CORE NETWORK** (Red central)



Arquitectura UMTS en un nivel general



Domino de Red de Acceso (UTRAN). Está formada por varios RNC's.

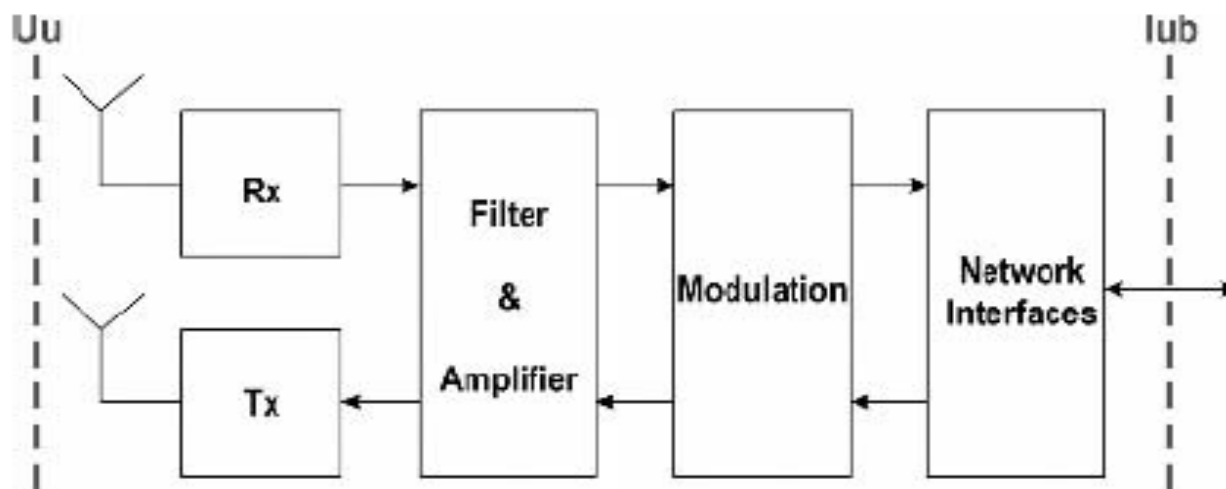


Diagrama del sistema de transmisión y recepción de la BS

# **MONITOREO Y SEGUIMIENTO EN TIEMPO REAL EN LA TX Y RX DENTRO DE UNA RED UMTS**

## Muestra :

- La información del UE.
- Cada nivel de Información.
- Información en distintos formatos: Mapas, Gráficos, Tablas y mensajes.

Almacena información para su posterior estudio y análisis.

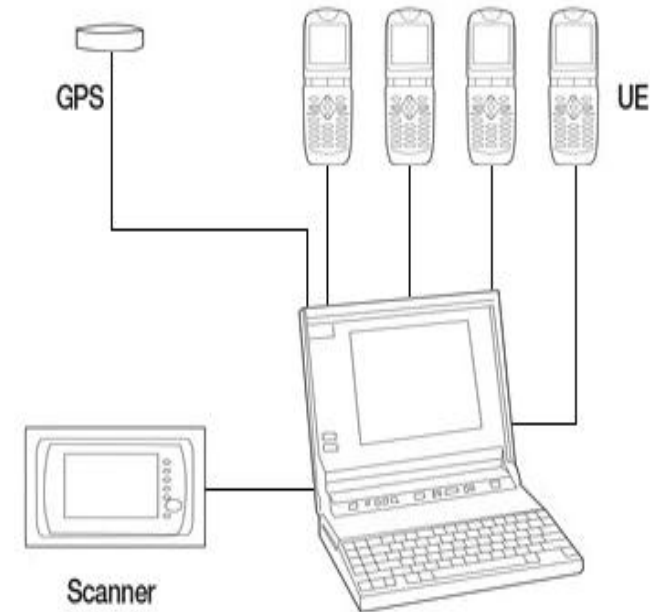
Soporta hasta 4 terminales de distintos fabricantes.

Control de Auto Llamada para Voz, Video telefonía, SMS.

Mapa en tiempo real.

Medidas Indoor.

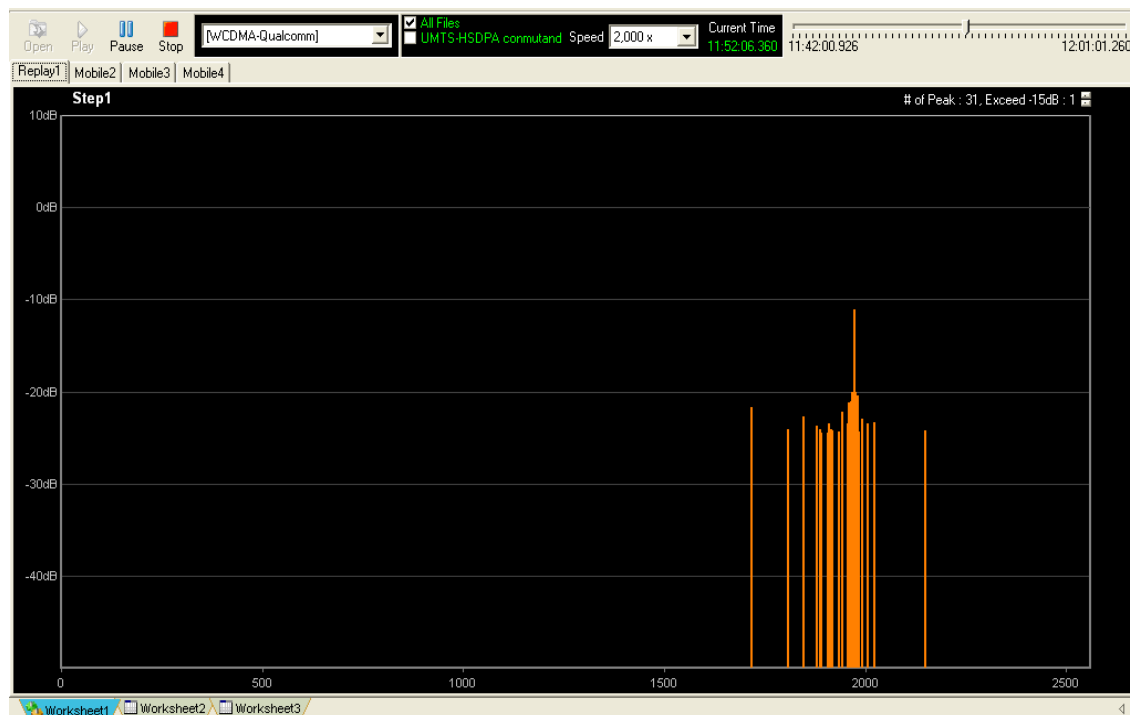
Decodificación de mensajes.



Esquema de monitoreo con XCALL-W

# **MONITOREO Y SEGUIMIENTO DE UNA TRANSMISIÓN UMTS-HSDPA**





Frecuencia de la conexión de una transmisión UMTS-HSDPA

Task	SC Code	Position	Energy	-30	0
P1	265	1979	-9,6		
P2	265	1979	-9,6		
P3	507	9681	-23,1		
P4	265	1979	-6,7		
P5	263	1723	-18,4		
P6	0				
P7					
P8					

Código scrambling exacto



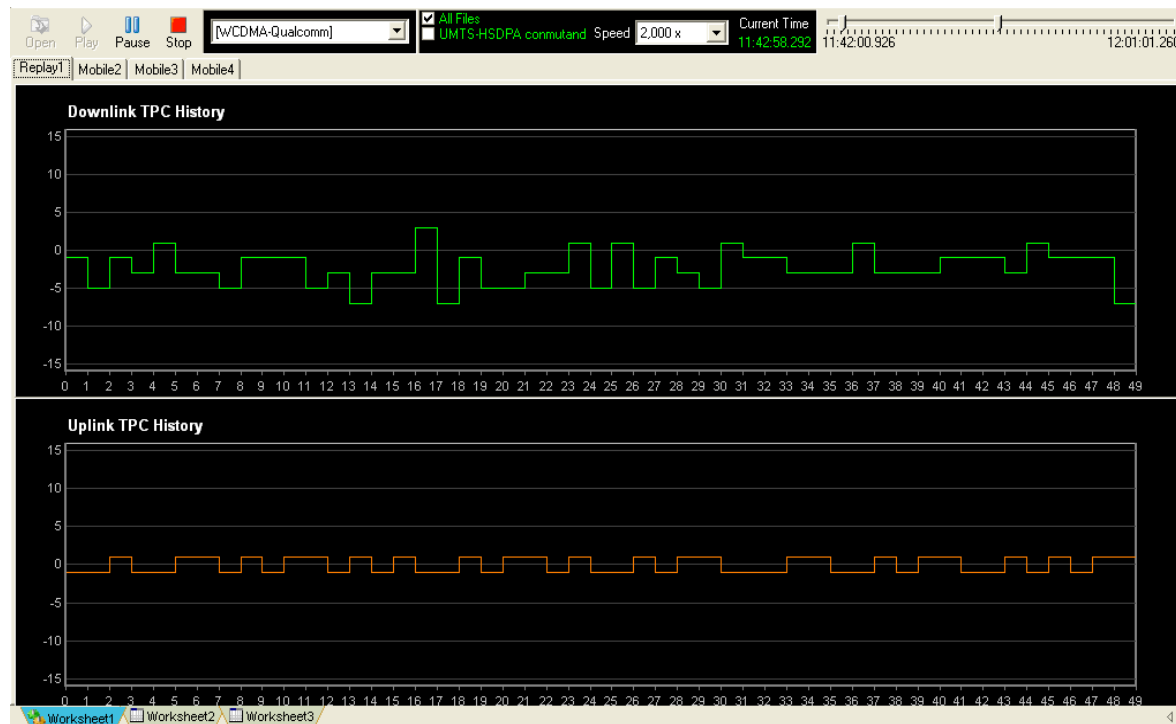
Relación portadora-interferencia alta al comienzo de una transmisión UMTS-HSDPA

Cell Information	
UL Freq(MHz)	1872.6(9763)
DL Freq(MHz)	2142.6(10713)
UTRAN Cell Identifier (UC-ID)	157023014
RNC-ID	2395
Cell Identifier(C-ID)	64294
URA Identity(SIB2)	4160
<b>Cell Access</b>	Cell not Barred
	Cell not Reserved
	Cell not Reserved for SoLSA
	UE camped on a cell
Cell Access	All Calls
UL Interference	-106 dBm

Información de la celda de una transmisión UMTS-HSDPA



Principales parámetros de los “fingers” del receptor RAKE al inicio de la conexión



Control de potencia en Tx y Rx durante la conexión.

WCDMA-Qualcomm | All Files | UMTS-HSDPA-M1.dm | Speed 2,000x | Current Time 11:42:17.755 | 11:42:00.926 | 12:01:01.260

Replay1 | Mobile2 | Mobile3 | Mobile4

WCDMA	Time	RxPo...	TxPo...	SIR	SFD...	SFU...	Combi...	UC-ID	RNC-ID	C-ID	Frequ...
Cell Info											
UC-ID											
RNC-ID											
C-ID											
Frequency											
RRC State											
MCC											
MNC											
LAC											
RF Info											
Rx Power(W)											
Tx Power(W)											
SIR											
BLER(w)											
SFDdownlink											
SFUpink	11:42:02	-97.2					9.4				
Best PSC(W)	11:42:03	-98.2					-9.1				
Best EcIo(W)	11:42:04	-97.9					-8.5				
Best RSCP(W)	11:42:05	-98.7					-8.7				
Combined EcIo(W)	11:42:07	-98.2					-9.1				
Active Cell Count	11:42:08	-97.3					-10.6				
Finger Info	11:42:09	-97.2					-9.2				
Top 1 Finger	11:42:10	-97.6	8.0				128	64	-7.2		
Top 1 PSC	11:42:11	-96.2	10.5	6.4	128	64	-7.2				
Top 1 EcIo	11:42:12	-97.9	10.1	5.2	128	64	-6.5				
Top 1 RSCP	11:42:13	-98.2	16.0	5.5	256	128	-6.9				
Top 1 EcIo	11:42:14	-97.5	16.9	5.4	256	128	-7.1				
Top 1 PSC	11:42:15	-97.3	16.8	5.3	256	16	-6.8				
Top 1 EcIo	11:42:16	-97.6	16.9	5.2	256	16	-6.6				
Top 1 RSCP	11:42:17	-97.0	16.6	5.3	256	16	-7.0				

WCDMA-Qualcomm | All Files | UMTS-HSDPA-M1.dm | Speed 2,000x | Current Time 11:43:27.224 | 11:42:00.926 | 12:01:01.260

Replay1 | Mobile2 | Mobile3 | Mobile4

WCDMA	Time	RxPo...	TxPo...	SIR	SFD...	SFU...	Combi...	UC-ID	RNC-ID	C-ID	Frequ...
Cell Info											
UC-ID	11:42:50	-96.6	16.4	4.0	256	16	-7.4	15702300	2395	64294	2142.6
RNC-ID	11:42:52	-97.3	15.9	4.8	256	64	-7.2	15702300	2395	64294	2142.6
C-ID	11:42:53	-96.4	18.0	4.3	256	64	-8.1	15702300	2395	64294	2142.6
Frequency	11:42:54	-98.8	16.9	6.0	256	32	-6.6	15702300	2395	64294	2142.6
RRC State	11:42:55	-99.3	16.7	6.0	256	16	-6.7	15702300	2395	64294	2142.6
MCC	11:42:56	-97.7	16.8	5.2	256	16	-7.3	15702300	2395	64294	2142.6
MNC	11:42:57	-98.5	18.8	5.3	256	32	-6.8	15702300	2395	64294	2142.6
LAC	11:42:58	-98.2	17.2	4.9	256	64	-6.9	15702300	2395	64294	2142.6
MCC	11:42:59	-99.2	17.8	6.4	256	16	-6.8	15702300	2395	64294	2142.6
MNC	11:43:00	-99.7	16.8	6.5	256	64	-5.8	15702300	2395	64294	2142.6
LAC	11:43:01	-97.5	15.0	5.2	256	64	-6.8	15702300	2395	64294	2142.6
RF Info	11:43:02	-96.8	16.9	4.4	256	16	-7.0	15702300	2395	64294	2142.6
Rx Power(W)	11:43:03	-96.1	17.3	5.0	256	16	-7.7	15702300	2395	64294	2142.6
Tx Power(W)	11:43:04	-97.7	15.9	3.9	256	16	-7.1	15702300	2395	64294	2142.6
SIR	11:43:05	-99.4	17.6	5.0	256	16	-8.5	15702300	2395	64294	2142.6
BLER(w)	11:43:06	-98.4	18.7	5.1	256	16	-6.2	15702300	2395	64294	2142.6
SFDdownlink	11:43:07	-94.8	17.5	4.6	256	16	-6.9	15702300	2395	64294	2142.6
SFUpink	11:43:08	-97.8	16.9	4.5	256	64	-7.2	15702300	2395	64294	2142.6
Best PSC(W)	11:43:08	-96.8	17.4	3.7	256	16	-8.3	15702300	2395	64294	2142.6
Best EcIo(W)	11:43:10	-96.1	17.6	4.3	256	16	-6.9	15702300	2395	64294	2142.6
Best RSCP(W)	11:43:11	-99.2	15.3	4.3	256	16	-7.3	15702300	2395	64294	2142.6
Combined EcIo(W)	11:43:12	-97.5	16.9	5.3	256	16	-6.0	15702300	2395	64294	2142.6
Active Cell Count	11:43:13	-99.2	16.5	4.0	256	16	-6.5	15702300	2395	64294	2142.6
Finger Info	11:43:14	-96.0	18.5	4.6	256	16	-7.9	15702300	2395	64294	2142.6
Top 1 Finger	11:43:15	-97.3	14.8	3.9	256	64	-6.6	15702300	2395	64294	2142.6
Top 1 PSC	11:43:16	-99.5	16.7	4.8	256	64	-9.9	15702300	2395	64294	2142.6
Top 1 EcIo	11:43:17	-94.8	17.5	3.9	256	32	-6.8	15702300	2395	64294	2142.6
Top 1 RSCP	11:43:18	-96.6	15.6	5.7	256	16	-8.1	15702300	2395	64294	2142.6
Top 1 EcIo	11:43:19	-97.5	14.1	3.8	256	64	-6.9	15702300	2395	64294	2142.6
Top 1 PSC	11:43:20	-99.0	13.8	4.4	256	64	-7.7	15702300	2395	64294	2142.6
Top 1 EcIo	11:43:21	-96.8	15.5	3.7	256	32	-7.0	15702300	2395	64294	2142.6
Top 1 RSCP	11:43:22	-96.6	14.5	2.8	256	32	-7.1	15702300	2395	64294	2142.6
Top 1 EcIo	11:43:23	-90.9	16.5	2.8	256	32	-10.1	15702300	2395	64294	2142.6
Top 1 PSC	11:43:24	-96.4	18.1	5.1	256	32	-8.7	15702300	2395	64294	2142.6
Top 1 EcIo	11:43:25	-99.9	17.9	5.4	256	16	-7.8	15702300	2395	64294	2142.6

Tabla que muestra los principales parámetros de la conexión

[WCDMA-Qualcomm]
  All Files
  UMTS-HSDPA conmutand Speed 1,000 x
 Current Time 11:49:47.496
 11:42:00.926 12:01:01.260

Replay1 | Mobile2 | Mobile3 | Mobile4 | All

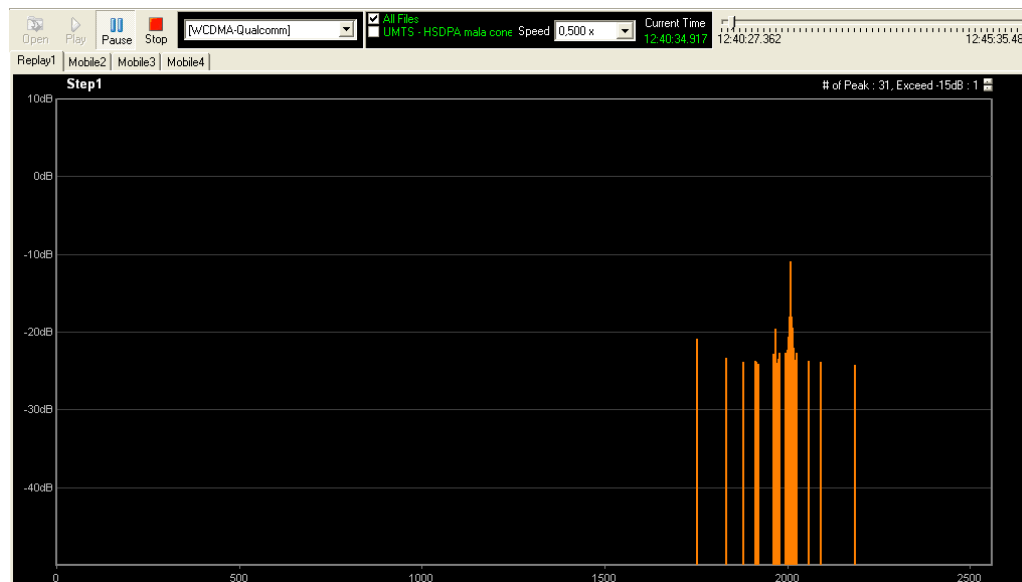
Moving Average Interval: 10 sec

Parameter	Current	Min	Max	Avg
Rx Power(dBm)	-96,8	-99,0	-90,0	-96,2
Tx Power(dBm)	15,3	14,8	16,1	15,5
BLER(%)		0,0	0,0	0,0
Best PSC	265			
Best Eclo(dB)	-6,1	-7,5	-5,7	-6,5
Comb Eclo(dB)	-8,6	-11,8	-7,7	-9,0
Best RSCP(dBm)	-103,0	-106,0	-96,7	-102,7

Resumen estadístico de toda la conexión UMTS-HSD

# **MONITOREO Y SEGUIMIENTO DE UNA TRANSMISIÓN UMTS-HSDPA CON MALA CONEXIÓN**





Frecuencia de la conexión de una transmisión UMTS-HSDPA  
“con errores”

Task	SC Code	Position	Energy	-30
P1	0			0
P2	265	2004	-8,8	
P3	0			
P4	265	2004	-8,9	
P5	265	2004	-8,4	
P6	0			
P7				
P8				

Código scrambling exacto

Task	SC Code	Position	Energy	-30
P1	0			0
P2	0			
P3	0			
P4	0			
P5	0			
P6	0			
P7				
P8				

Código scrambling cuando se presentan errores en la conexión

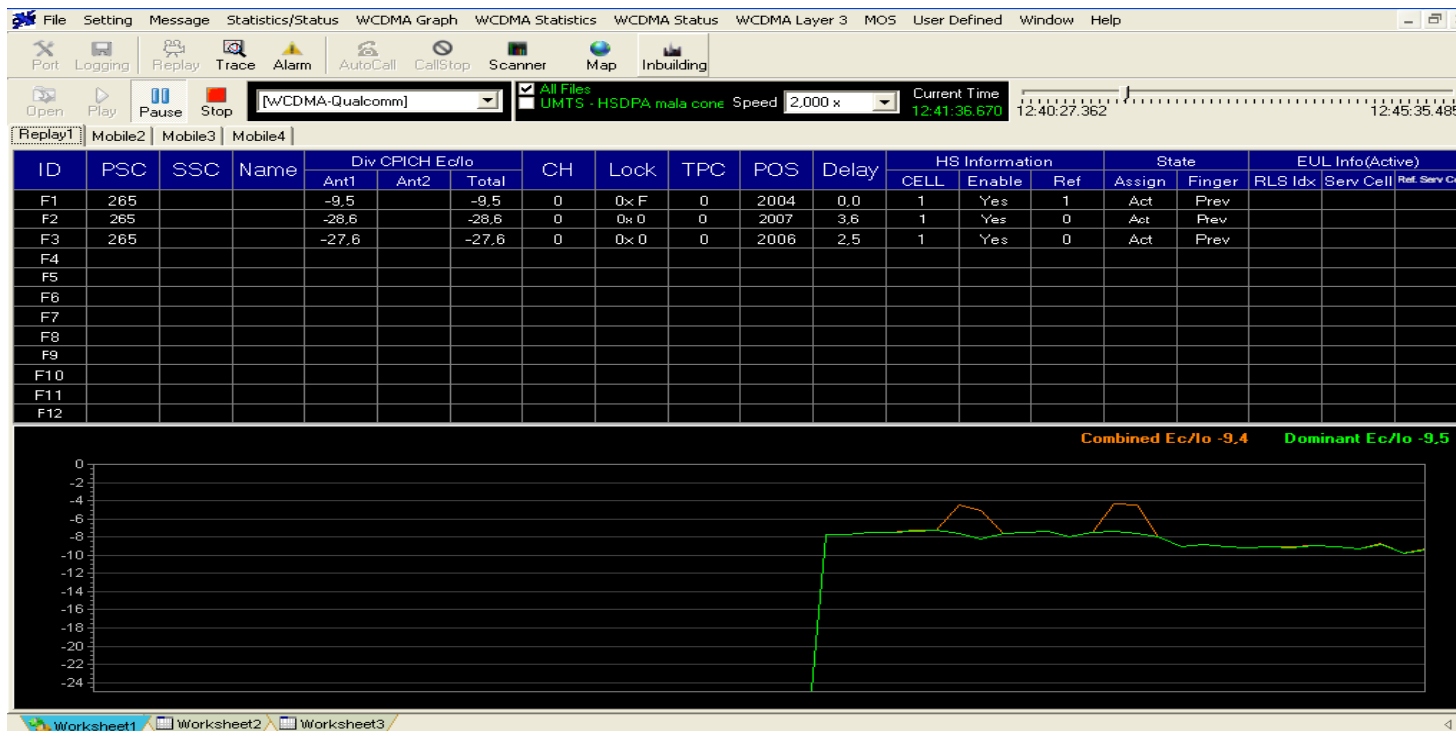


Open Play Pause Stop [WCDMA-Qualcomm]  All Files  UMTS - HSDPA mala cone Speed 4,000 x Current Time 12:45:35.485  
 12:40:27.362 12:45:35.485

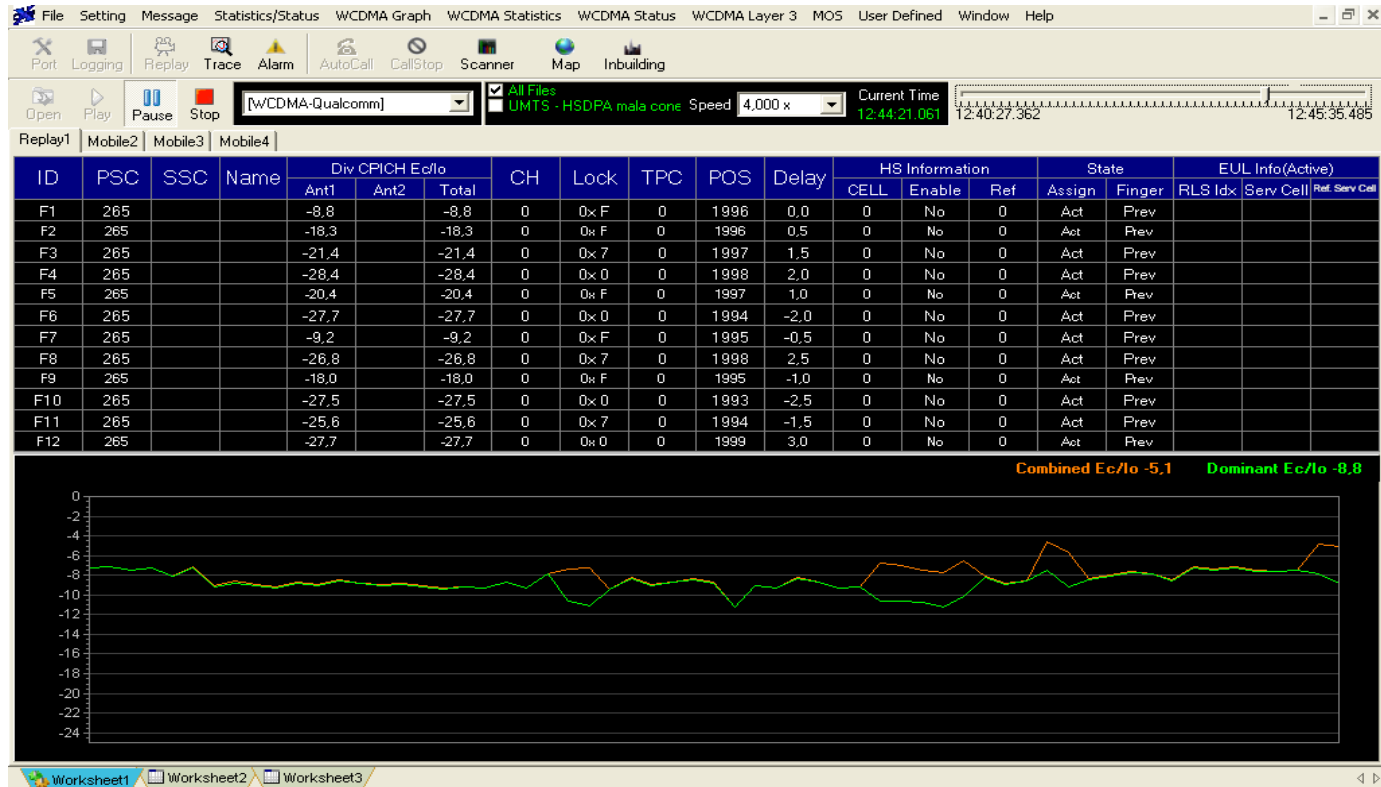
Replay1 Mobile2 Mobile3 Mobile4

Cell Information	
UL Freq(MHz)	1872,6(9763)
DL Freq(MHz)	2142,6(10713)
UTRAN Cell Identifier (UC-ID)	157023014
RNC-ID	2395
Cell Identifier(C-ID)	64294
URA Identity(SIB2)	4160
<b>Cell Access</b>	Cell not Barred
	Cell not Reserved
	Cell not Reserved for SoLSA
	UE camped on a cell
Cell Access	All Calls
UL Interference	-106 dBm

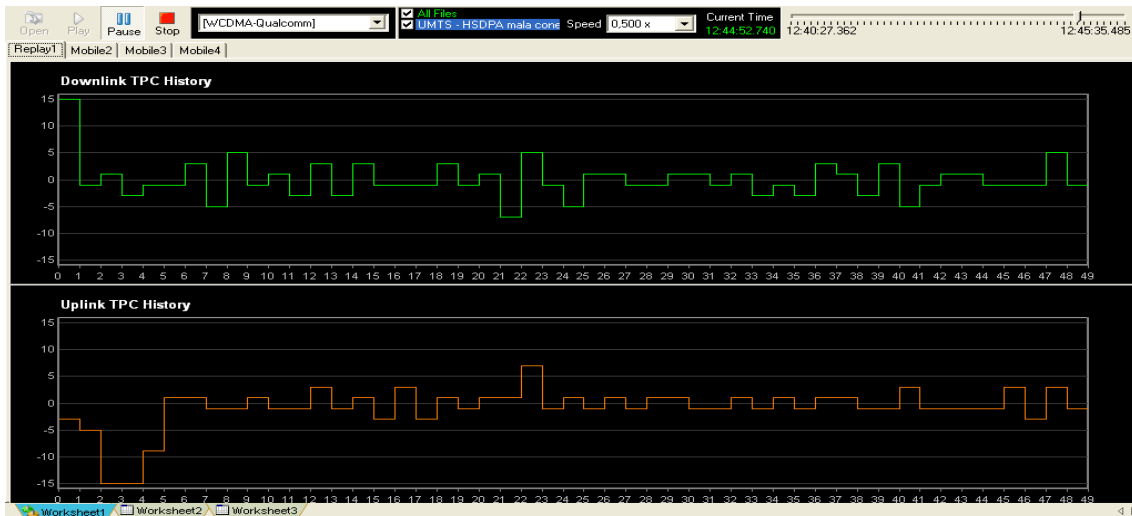
Información de la celda en una conexión UMTS-HSDPA 2 “con errores”



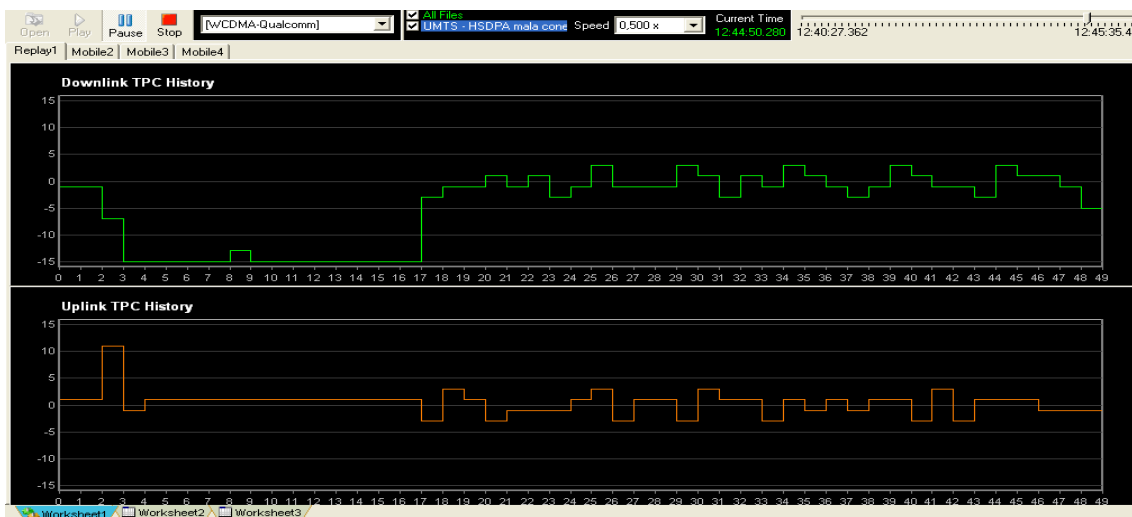
Comportamiento de los “fingers” del receptor RAKE al inicio de la conexión



Comportamiento de los “fingers” del receptor RAKE durante la conexión



Control de potencia en Tx y Rx al inicio de una transmisión UMTS-HSDPA “con errores”.



Control de potencia en Tx y Rx de una transmisión UMTS-HSDPA “con errores” cuando recupera la conexión

# TABLA DEFINIDA DEL USUARIO

WCDMA-Qualcomm | All Files | UMTS - HSDPA mala cone | Speed 4,000 x | Current Time 12:41:54.689 | 12:40:27.362 | 12:45:3

Replay1 | Mobile2 | Mobile3 | Mobile4

	Time	Rx Po...	Tx Po...	SIR	SFDI...	SFU...	Combi...	UC-ID	RNC-ID	C-ID	Freq...
Top 3 PSC	12:41:14	-99.5	15.6		128			15702300	2395	64294	2142.6
Top 3 Ecdo	12:41:15	-97.8			128	-4.4		15702300	2395	64294	2142.6
Top 4 Finger	12:41:16	-98.1			128	-4.9		15702300	2395	64294	2142.6
Top 4 PSC	12:41:17	-97.5	15.6		128	-7.9		15702300	2395	64294	2142.6
Top 4 Ecdo	12:41:18	-98.2	10.2	5.4	128	64	-7.4	15702300	2395	64294	2142.6
GSM/GPRS	12:41:19	-96.3	10.5	4.6	128	128	-7.9	15702300	2395	64294	2142.6
Cell Info	12:41:20	-97.9	16.0	5.5	256	128	-7.6	15702300	2395	64294	2142.6
C-ID	12:41:21	-99.0	16.2	4.0	256	128	7.3	15702300	2395	64294	2142.6
BCH CH Num	12:41:22	-97.3			256	128	-4.3	15702300	2395	64294	2142.6
TCH CH Num	12:41:23	-98.4			256	128	-4.8	15702300	2395	64294	2142.6
BSIC	12:41:24	-98.5			256	128	-4.9	15702300	2395	64294	2142.6
Time Slot Num	12:41:25	-97.5			256	128	8.1	15702300	2395	64294	2142.6
LAC	12:41:26	-99.0					-8.8	15702300	2395	64294	2142.6
Channel Type	12:41:27	-97.0	10.0		64	-9.1		15702300	2395	64294	2142.6
RF Info	12:41:28	-96.4	9.9	5.7	128	64	-9.8	15702300	2395	64294	2142.6
Serving Rx Power	12:41:29	-97.7	9.9	5.4	128	64	-8.9	15702300	2395	64294	2142.6
Rx Lev(F)	12:41:30	-98.7	17.9	4.7	256	16	-9.2	15702300	2395	64294	2142.6
Rx Lev(S)	12:41:31	-97.2	17.8	5.0	256	64	-9.4	15702300	2395	64294	2142.6
Rx Qual(F)	12:41:32	-98.1	17.8	4.9	256	16	-9.1	15702300	2395	64294	2142.6
Rx Qual(S)	12:41:33	-97.7	17.0	5.3	256	16	-9.0	15702300	2395	64294	2142.6
Rx Qual(S)_BER	12:41:34	-97.7	17.3	4.7	256	16	-9.3	15702300	2395	64294	2142.6
Rx Qual(S)_BER	12:41:35	-96.6	18.2	5.5	256	16	-9.8	15702300	2395	64294	2142.6
Tx Lev	12:41:36	-95.1	18.4	3.4	256	16	-9.0	15702300	2395	64294	2142.6
Tx Lev_dBm	12:41:37	-96.1	17.2	3.9	256	16	-9.6	15702300	2395	64294	2142.6
TA	12:41:38	-95.3	17.4	5.2	256	16	-9.2	15702300	2395	64294	2142.6
RLT(MAX)	12:41:39	-96.6	17.7	5.0	256		-9.3	15702300	2395	64294	2142.6
	12:41:40	-96.1	17.2	4.3	256	128	-10.2	15702300	2395	64294	2142.6
	12:41:41	-96.2	14.3		256	128	-8.4	15702300	2395	64294	2142.6
	12:41:42	-96.8			256	128	-8.8	15702300	2395	64294	2142.6
	12:41:43	-95.8			256	128	-9.3	15702300	2395	64294	2142.6
	12:41:44	-97.6			256	128	-8.5	15702300	2395	64294	2142.6
	12:41:45	-96.8	14.3		128			15702300	2395	64294	2142.6
	12:41:46	-95.3			128	-7.2		15702300	2395	64294	2142.6
	12:41:47	-96.6			128	-6.4		15702300	2395	64294	2142.6
	12:41:48	-96.1			128	-11.0		15702300	2395	64294	2142.6

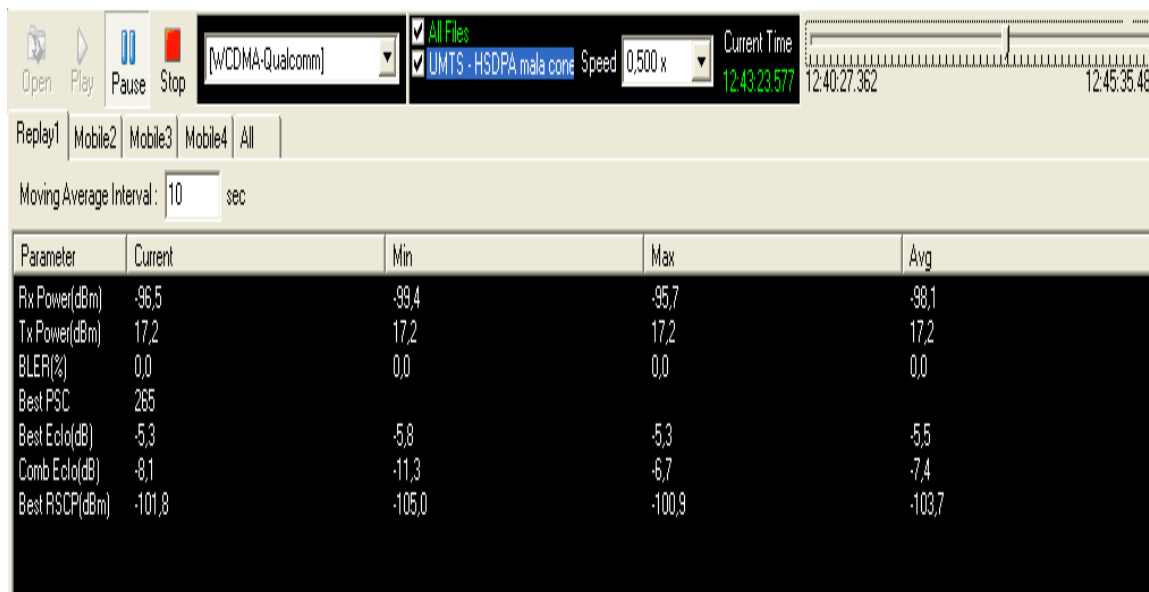
WCDMA-Qualcomm | All Files | UMTS - HSDPA mala cone | Speed 2,000 x | Current Time 12:45:30.723 | 12:40:27.362 | 12:45:35.485

Replay1 | Mobile2 | Mobile3 | Mobile4

	Time	Rx Po...	Tx Po...	SIR	SFDI...	SFU...	Combi...	UC-ID	RNC-ID	C-ID	Freq...
Cell Info	12:44:58	-95.8	18.2	5.8	256	32	-8.1	15702300	2395	64294	2142.6
UC-ID	12:44:59	-97.0	19.5	4.9	256	64	-7.8	15702300	2395	64294	2142.6
RNC-ID	12:45:00	-97.6	17.8	4.9	256	64	-7.5	15702300	2395	64294	2142.6
C-ID	12:45:01	-98.3	17.1	4.7	256	64	-7.3	15702300	2395	64294	2142.6
Frequency	12:45:02	-98.5	17.5	3.9	256	64	-7.2	15702300	2395	64294	2142.6
RRC State	12:45:03	-97.8	17.8	3.6	256	128	-7.1	15702300	2395	64294	2142.6
MCC	12:45:04	-98.7	17.2		256	128	-7.0	15702300	2395	64294	2142.6
MNC	12:45:05	-98.1			256	128	-7.1	15702300	2395	64294	2142.6
LAC	12:45:06	-98.5			256	128	-7.4	15702300	2395	64294	2142.6
	12:45:07	-98.7			256	128	-7.2	15702300	2395	64294	2142.6
	12:45:08	-98.7					-6.9	15702300	2395	64294	2142.6
	12:45:09	-97.9					-7.4	15702300	2395	64294	2142.6
Rx Power(W)	12:45:10	-98.9					-6.9	15702300	2395	64294	2142.6
Tx Power(W)	12:45:11	-98.5					-7.1	15702300	2395	64294	2142.6
SIR	12:45:12	-97.9					-7.3	15702300	2395	64294	2142.6
BLER(W)	12:45:13	-97.9					-7.1	15702300	2395	64294	2142.6
SFDI(Downlink)	12:45:14	-96.5			128	-7.3		15702300	2395	64294	2142.6
SFI(Uplink)	12:45:15	-98.9			128	-4.2		15702300	2395	64294	2142.6
Best PSD(W)	12:45:16	-96.8			128	-4.3		15702300	2395	64294	2142.6
Best Ecdo(W)	12:45:17	-98.3			128	-8.4		15702300	2395	64294	2142.6
Best RSCP(W)	12:45:18	-97.0			128	-9.0		15702300	2395	64294	2142.6
Combined Ecdo(W)	12:45:19	-97.2					-9.6	15702300	2395	64294	2142.6
Active Cell Count	12:45:20	-98.1					-8.6	15702300	2395	64294	2142.6
	12:45:21	-96.3					-10.0	15702300	2395	64294	2142.6
	12:45:22	-96.9					-8.7	15702300	2395	64294	2142.6
	12:45:23	-96.1					-10.9	15702300	2395	64294	2142.6
Top 1 Finger	12:45:24	-97.6					-9.8	15702300	2395	64294	2142.6
Top 1 PSC	12:45:25	-97.3					-9.6	15702300	2395	64294	2142.6
Top 1 Ecdo	12:45:26	-97.8					-10.0	15702300	2395	64294	2142.6
	12:45:27	-98.7					-7.9	15702300	2395	64294	2142.6
	12:45:28	-96.9	10.2	6.1	128	64	-7.7	15702300	2395	64294	2142.6
	12:45:29	-96.6	9.8	4.1	128	64	-8.8	15702300	2395	64294	2142.6
	12:45:30	-97.3	11.1	6.6	256	128	-7.8	15702300	2395	64294	2142.6
	12:45:31	-97.3	17.2	3.4	256	128	-7.8	15702300	2395	64294	2142.6

Tabla definida del usuario de una conexión UMTS-HSDPA "con errores"





Resumen estadístico de la transmisión UMTS-HSDPA “con errores”