

Making**Wireless**

LoCosto Family UPDATE

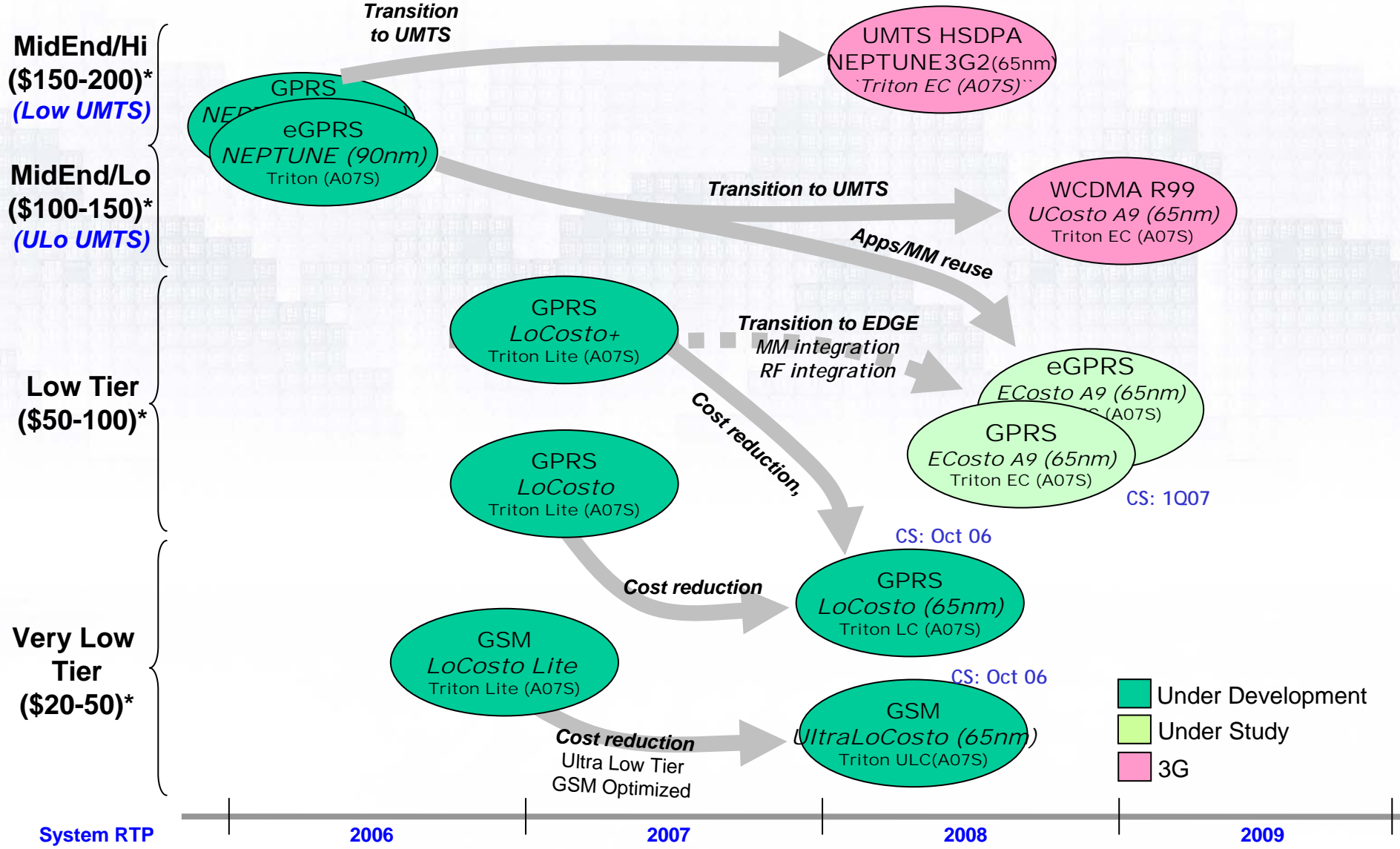
Feb06



Technology for Innovators™

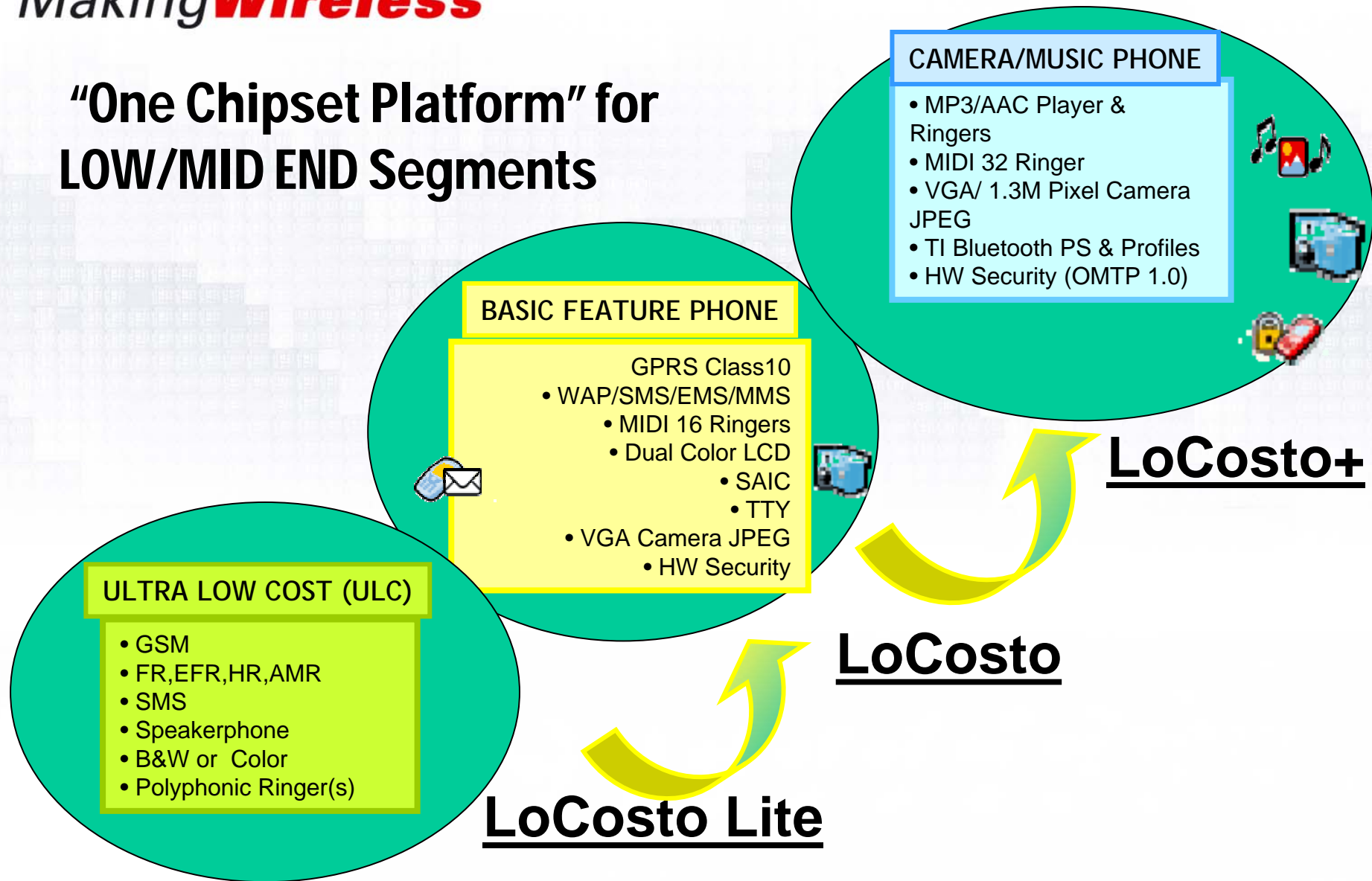
 TEXAS INSTRUMENTS

Making **Wireless** 2.5G Roadmap

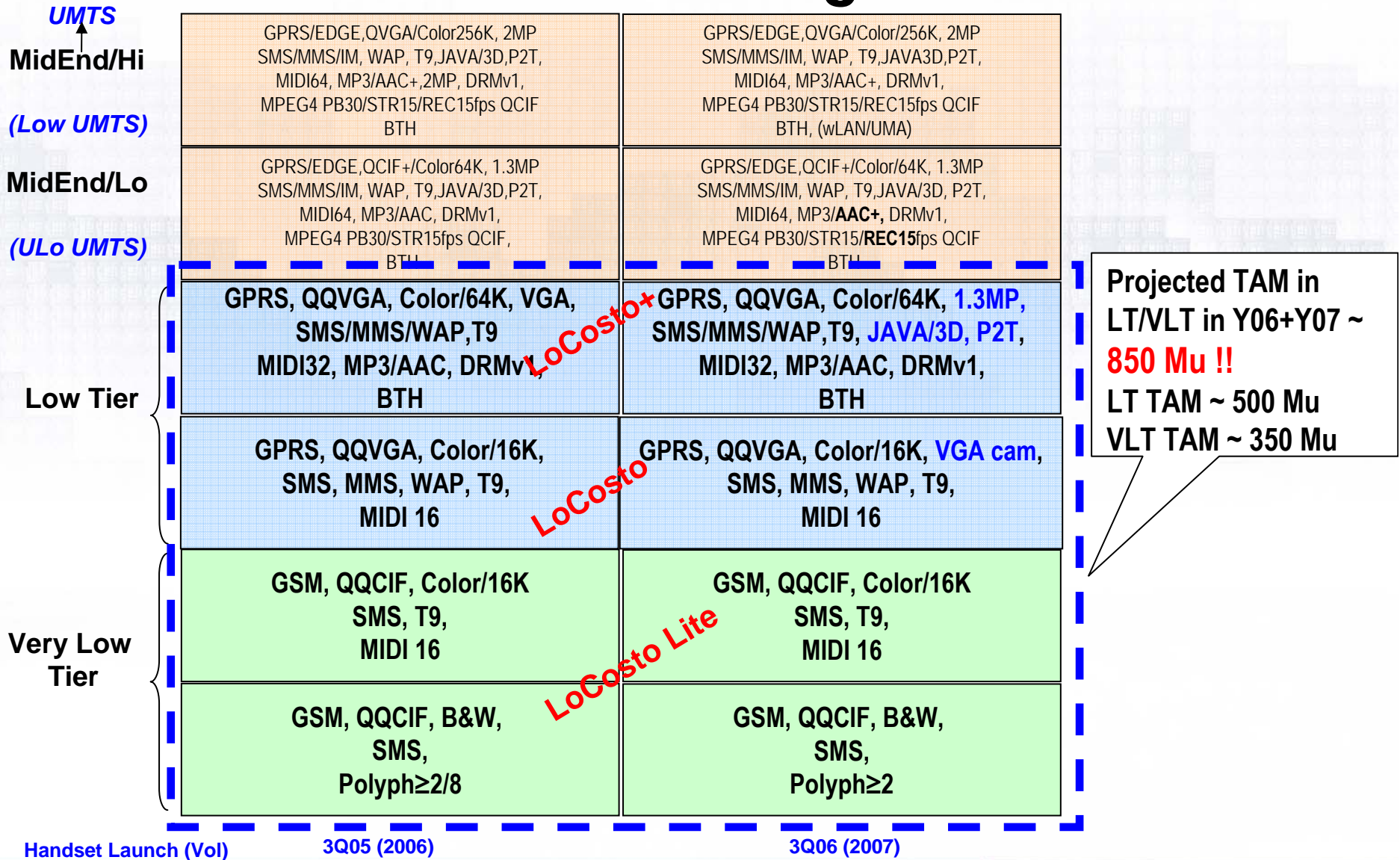


Making **Wireless**

“One Chipset Platform” for LOW/MID END Segments



Making **Wireless** Market Segmentation



Making **Wireless** LoCosto Product offering

		Locosto Lite	LoCosto	LoCosto+
Phone Type		Basic GSM Voice Centric	Low End GPRS Entry Camera	Mid-End GPRS Camera/Music
Typical Apps Suite		MMI (no PIM)	MMI (w/ Smart Phone Book)	MMI (w/ Smart Phone Book)
		Voice - Telephony	Voice - Telephony	Voice - Telephony
		Messaging - SMS	Messaging - SMS, EMS, MMS, IM	Messaging - SMS, EMS, MMS, IM
		Polyphonic (≥2v, No MIDI)	Polyphonic (MIDI 16 voices mono)	Polyphonic (MIDI 32 voices stereo)
		Browser - WAP 2.0, WML, xHTML	Browser - WAP 2.0, WML, xHTML	
		Pred Text, Lang Pack (Chinese)	Pred Text, Lang Pack (Chinese)	Java/Gaming – JSR 185/135
TCS3.2.x Features	<i>Security</i>	Yes	Yes	Yes
	<i>MIDI 16 Mono Ringer/Player</i>	Yes	Yes	Yes
	<i>MIDI 32 Stereo Ringer/Player</i>	No	No	Yes
	<i>MP3 Ringer/Player</i>	No	No	Yes
	<i>AAC Ringer/Player</i>	No	No	Yes (TBC)
	<i>Camera Capture/Preview</i>	No	Yes	Yes
	<i>IrDA Protocol Stack</i>	No	No	Yes
	<i>USB driver</i>	No	Yes	Yes
	<i>BTH Protocol Stack & profiles</i>	No	No	Yes
	<i>Camera Capture/Preview</i>	No	Yes	Yes
	<i>NAND Driver</i>	No	Yes	Yes
External Memory Estimation *	NOR Flash/PSRAM	16 Mb/0 Mb	32 Mb/16 Mb	64 Mb/32Mb
Engine's Features	<i>Standard</i>	GSM	GPRS Class 10	GPRS Class 10
	<i>Voice Codec</i>	H/R, F/R, EF/R, AMR	H/R, F/R, EF/R, AMR	H/R, F/R, EF/R, AMR
	<i>Internal SRAM</i>	2.5Mbits	2.5Mbits	2.5Mbits
	<i>RF Band</i>	2 x Dual	Quad	Quad
	<i>H/W security</i>	Yes	Yes	Yes
	<i>MIDI 16 Mono (ROM)</i>	Yes	Yes	Yes
	<i>MIDI 32 Stereo (ROM)</i>	No	No	Yes
	<i>MP3 Decode (ROM)</i>	No	No	Yes
	<i>AAC Decode (ROM)</i>	No	No	Yes
	<i>JPEG Encode/Decode (ROM)</i>	No	Yes	Yes
	<i>Speakerphone/Handsfree</i>	Yes	Yes	Yes
	<i>IrDA Interface</i>	Yes	Yes	Yes
	<i>USB Interface</i>	Yes	Yes	Yes
	<i>Camera Interface (serial & parallel)</i>	No	Yes	Yes
	<i>Parallel LCD Interface</i>	Yes	Yes	Yes
<i>PSRAM, NOR and NAND Flash I/F</i>	PSRAM and NOR Flash	Yes	Yes	
Engine		Locosto-Lite	Locosto	Locosto+
		Triton-Lite	Triton-Lite	Triton-Lite

* : Definitive memory configuration is dependant on the final product's spec

Making **Wireless** LoCosto+ C027 SOC

DRP2.0 RF

Integrated 4 band, DCTCXO
GSM/GPRS, Class 10 (12 capable),
minimum external components

Power Management

Integrated RF and Core

Internal Memory

SRAM and ROM

DUAL Processors

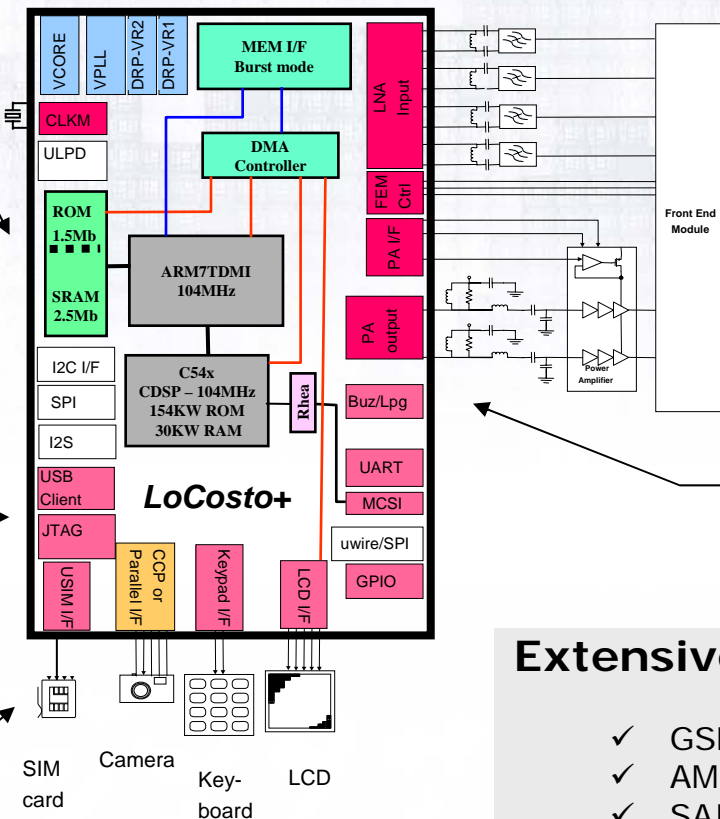
C54 DSP and ARM7™

Peripheral Interfaces

Camera, BT, USB, Keypad
Vibrator, SIM and LCD

Multimedia support

Stereo polyphonic ring tones,
300KP camera, MP3, and JPEG



External Memory support

SIM, DMA access, burst mode,
SRAM, Flash (NOR & NAND)

Security

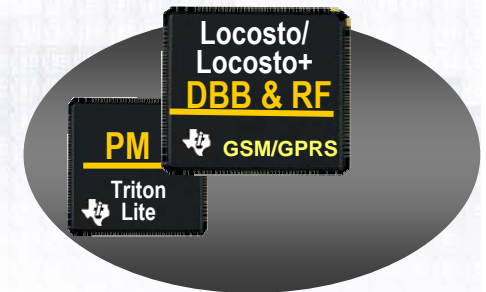
Flash content, IMEI
protection, SIM lock

Extensive Software support:

- ✓ GSM/GPRS Layer 1,2,3
- ✓ AMR, FR, HR, EFR and TTY
- ✓ SAIC over GSM
- ✓ MMI for Test

Making **Wireless** LoCosto+ Enabling Camera/Music Trendy Phones

- ❑ **Industry Leading Digital Radio Processor (DRP) Technology – Integrated RF**
 - ✓ Migrates radio functions to the most advanced CMOS technology available
 - ✓ Significantly improved power consumption and reduced board space
 - ✓ SW calibration for performance improvements
- ❑ **Digital baseband combining ARM7 MCU and C54™ DSP both running @ 104MHz**
- ❑ **Integrated Multimedia & Connectivity:**
 - ✓ Audio: MP3/AAC/MIDI32 Player & Ringer
 - ✓ Camera: From VGA to 1.3Mpix support
 - ✓ Bluetooth (incl. integrated PS & profiles)
 - ✓ IrDA and USB
 - ✓ Primary & Secondary Color LCD
- ❑ **TI M-Shield™ - Industry leading HW-Based Security**
 - ✓ Hardware-based Secure Execution & Storage Environment (incl. HW Accelerated Cryptography)
 - ✓ Flash content protection
 - ✓ Terminal identity protection (IMEI)
 - ✓ Network lock protection (SIMlock)
 - ✓ Enabling the deployment of value-added secure services
- ❑ **Optimized BOM to address from basic GPRS to high-end entry music/camera type of phones**
 - ✓ State-of-the-art 90nm CMOS process => roadmap to 65nm
 - ✓ Minimized component count frees up board space

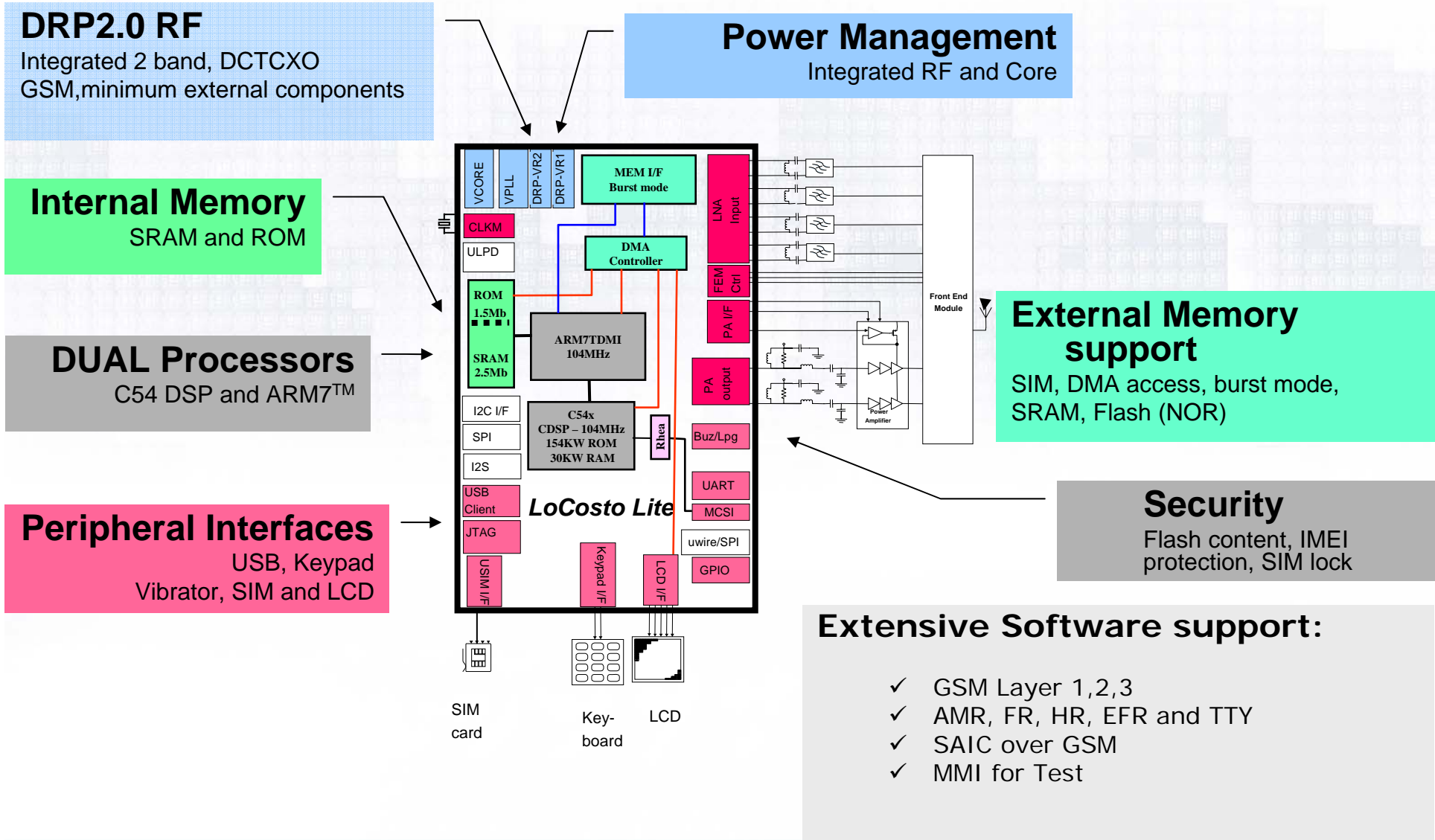


LoCosto+ S/W Reference Implementation

TCS3.2: L1/2/3 + basic color MMI

- GSM (SAIC support) / GPRS Multi-slot Class 10
- Quad Band 2US+2EU or 2US+1EU or 1US+2EU
- Voice codecs FR, HR, EFR, AMR
- TTY (HR, FR, AMR)
- Color LCD (65K).
- VGA Camera viewfinder and snapshot (JPEG encode/decode of VGA images).
 - ✓ Advanced VGA: Rotation, Burst, Zoom, Picture gallery Overlay supports
- MIDI 32 ring-tone and playback
- MP3 player
- Vibrator
- Hands-free (full duplex speakerphone), Headset
- USB client 2.0 (full speed) for flashing, modem, mass-storage and traces
- Enhanced S/W Security (Flash content protection, IMEI protection, ME personalization)
- USIM
- BAT (Application interface for WAP/MMS/SMS/EMS)
- NAND Flash file system
- Embedded Bluetooth stack and profiles.
- Audio Improvements
 - Noise Reduction (ANR V2.13).
 - Downlink equalization Filter (IIR V4.0)
 - AGC V1.0 (Automatic Gain Control)
 - Acoustic Echo Canceller V2.0 (Step Size Control)
 - DRC 1.0 (Dynamic Range Compression for Speech)

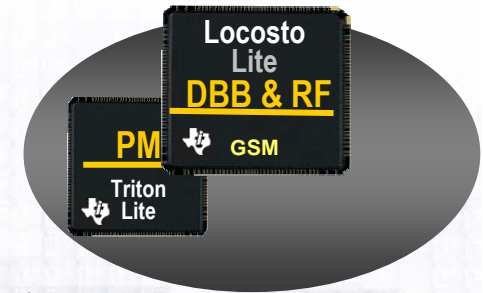
Making **Wireless** LoCosto Lite SOC



Making **Wireless**

LoCosto Lite Enabling Ultra Low-Cost Handsets

- ❑ **Industry Leading Digital Radio Processor (DRP) Technology – Integrated RF**
 - ✓ Migrates radio functions to the most advanced CMOS technology available
 - ✓ Significantly improved power consumption and reduced board space
 - ✓ SW calibration for performance improvements
- ❑ **Digital baseband combining ARM7 MCU and C54™ DSP both running @ 104MHz**
- ❑ **Optimized Memory Footprint**
 - ✓ Have a major impact on eBOM cost by having no SRAM and only 2MB/16Mb external flash
- ❑ **Integrated MIDI**
 - ✓ Up to MIDI 16 SW
 - ✓ TI offers even smaller-sized polyphonic SW
- ❑ **TI M-Shield™ - Industry leading HW-Based Security**
 - ✓ Hardware-based Secure Execution & Storage Environment (incl. HW Accelerated Cryptography)
 - ✓ Flash content protection
 - ✓ Terminal identity protection (IMEI)
 - ✓ Network lock protection (SIMlock)
 - ✓ Enabling the deployment of value-added secure services
- ❑ **Integrated Speakerphone Mode**
- ❑ **Roadmap to further optimized ULC designs**
 - ✓ Next generation solutions provide even lower eBOM
- ❑ **Optimized BOM to address ultra low-cost phone market**
 - ✓ State-of-the-art 90nm CMOS process => roadmap to 65nm
 - ✓ Minimized component count frees up board space



LoCosto Lite S/W Reference Implementation

TCS3.2: L1/2/3 + basic B&W MMI

- GSM only (no CSD), SAIC
- Dual band 850/1900 or **900/1800 or 850/1800 or 900/1900**

- Voice codecs FR, HR, EFR, AMR
- TTY over FR, EFR, AMR
- MIDI ringtone & playback - 16 polyphonies as a minimum with a 100KB DLS
- USB client flashing & trace
- 3K reserved for LCD frame buffer (based on 96x96 B&W)
- MIDI ring-tone & playback – up to 16 polyphonies with a 100KB DLS, support for over the air download
- Vibrator
- Enhanced S/W Security (Flash content protection, IMEI protection, ME personalization)
- USIM
- Audio Enhancements
 - Noise Reduction (ANR V2.13).
 - Downlink equalization Filter (IIR V4.0)
 - AGC V1.0 (Automatic Gain Control)
 - Acoustic Echo Canceller V2.0 (Step Size Control)
 - DRC 1.0 (Dynamic Range Compression for Speech)
- 85K reserved for customer MMI , to replace/customize BMI**

Memory footprint:

- No external SRAM
- 2MB Flash

Making **Wireless** Customers Engagement Plan

❑ Hardware Deliveries

- ✓ LoCosto Lite & LoCosto+ CS1.0 : Now
- ✓ LoCosto Lite & LoCosto+ CS1.11 : Now
- ✓ LoCosto Lite & LoCosto+ CS2.0 : Mar06
- ✓ Triton Lite (based on Triton2.2) CS2.1 : Now
- ✓ Triton Lite (based on Triton2.2) CS2.2 : Feb06

❑ Development board

- ✓ I-sample V1.1 (LoCosto+1.0 – Triton1.1) : Now
- ✓ I-sample V2.0 (Based on LoCosto+1.0 – Triton Lite1.0) : Now
- ✓ I-sample V2.1 (Based on LoCosto+1.11 - Triton Lite2.2) : Feb06
- ✓ I-sample V3.0 (Based on LoCosto+2.0 – Triton Lite2.2) : Apr06

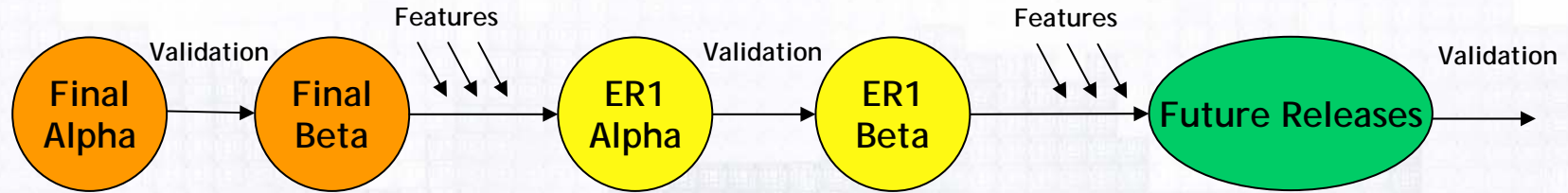
❑ RTP Hardware

- ✓ LoCosto Lite & LoCosto+ 2.0 : Jun06
- ✓ Triton Lite2.2 : May06

Making **Wireless**

LoCosto SW Release Plan

Making **Wireless** LoCosto Software Release Plan



	31 Jan 06 (= SysTest MS 4)	28 Apr 06 (= SysTest MS 5)	28 Apr 06	30 June 06 (= SysTest MS 6)	TBD	TBD
HW	LoCosto 1.11 Triton Lite 2.2 Compatible with Triton Lite 2.0	LoCosto 2.0 Triton Lite 2.2 Compatible with LoCosto 1.11 + Triton Lite 2.0	LoCosto 2.0 Triton Lite 2.2 Compatible with LoCosto 1.11 + Triton Lite 2.0	LoCosto 2.0 Triton Lite 2.2 Compatible with LoCosto 1.11 + Triton Lite 2.0	LoCosto 2.0 Triton Lite 2.2 Compatible with LoCosto 1.11 + Triton Lite 2.0	LoCosto 2.0 Triton Lite 2.2 Compatible with LoCosto 1.11 + Triton Lite 2.0
SW	POR features +: •Nucleus 1.15 •LNA swap •AAC Player 1) •WCP profiler SAIC for GSM scheduled for 03/15/06		•Flash Optim. 2) •Imaging ERs 1) •TCP/IP 1) •T-Flash 1) •NAVC		•PCM raw data 1) •AAC ringer 1 •R99 •MP3 RWD/FWD 1) •Add. BT profiles 1) •CPHS •Chase combining •UART modem/trace multipl. 2) •PTT voice buffer. •Performance enh. (NAND, USB)	

1) Only LoCosto+ 2) Only LoCosto Lite

Making **Wireless** LoCostolite SW Releases

<p>ALPHA 1 (Aug. 30,'05)</p> <ul style="list-style-type: none"> ❑ GSM ❑ Dual Band config ❑ Voice codecs FR, HR, EFR, AMR ❑ LCD driver supplied ❑ MIDI ring-tone and playback ❑ Vibrator ❑ Hands-free (HW modifications needed for supporting speakerphone) ❑ Headset Support ❑ USB client 2.0 (FS) for traces ❑ UART ❑ USIM ❑ BMI/MFW ❑ Support for simplified Chinese and EZIText (compiled OFF) ❑ Keypad 5x5 ❑ Voice memo support ❑ E1 decoder 	<p>ALPHA 2 (Oct15,'05)</p> <ul style="list-style-type: none"> ❑ Partial GSM memory optimization ❑ Security (IMEI protection & ME personalization). <ul style="list-style-type: none"> ✓ Network Lock ✓ Subset lock ✓ Service provider Lock ✓ SIM lock ✓ Multiple Network Personalisation ❑ GSM memory optimization ❑ MIDI 16 ❑ New DRP script file enhancing sensitivity 	<p>Alpha 3 (Nov. 15,'05)</p> <ul style="list-style-type: none"> ❑ Audio Improvements <ul style="list-style-type: none"> ✓ Noise Reduction (ANR V2.13). ✓ Downlink equalization Filter (IIR V4.0) ✓ AGC V1.0 (Automatic Gain Control) ✓ Acoustic Echo Canceller V2.0 (Step Size Control) ✓ DRC 1.0 (Dynamic Range Compression for Speech) ❑ TTY over HR, FR & AMR ❑ Mirror bit Flash support ❑ Power Management Optimization ❑ Memory Opt: <ul style="list-style-type: none"> ✓ ACI Phone Book ✓ Linear file system (needed for MIDI player on LoCosto Lite without SRAM). ✓ Additional optimizations to reach 2.5Mb 	<p>Final Alpha (Jan 31'06)</p> <ul style="list-style-type: none"> ❑ Upgrade to Nucleus 1.15 ❑ LNA reuse for different band ❑ WCP profiler ❑ DRP update (DXCO calibration) <p>Alpha Patches Feb15'06: TTY BER bug fix Mar 15'06: SAIC for GSM Alpha Release</p> <hr/> <p>BETA (Apr 28' 06)</p> <ul style="list-style-type: none"> ❑ Validated SW delivery with Bug fixing ❑ SAIC for GSM completely validated
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All dates are release dates to TI Soldel team

Making **Wireless** LoCosto+ SW Releases

<p>ALPHA 1 (Aug. 30,'05)</p> <ul style="list-style-type: none"> <input type="checkbox"/> GSM/GPRS Multi-slot Class 10 <input type="checkbox"/> Quad Band 2US+2EU or 2US+1EU or 1US+2EU <input type="checkbox"/> Voice codecs FR, HR, EFR, AMR <input type="checkbox"/> Color LCD driver(64K). <input type="checkbox"/> VGA Camera viewfinder and snapshot (JPEG encode/decode). <input type="checkbox"/> MIDI ring-tone and playback <input type="checkbox"/> MP3 player. <input type="checkbox"/> Vibrator <input type="checkbox"/> Hands-free (full duplex speaker phone)support <input type="checkbox"/> Headset <input type="checkbox"/> USB client 2.0 (FS) for flashing, modem and traces <input type="checkbox"/> UART support <input type="checkbox"/> Enhanced SW Security (Flash content protection) & Enh. HW security <input type="checkbox"/> USIM <input type="checkbox"/> BAT (Application interface for WAP/MMS/SMS/EMS) <input type="checkbox"/> BMI/MFW incl. simplified Chinese and EZIText <input type="checkbox"/> JPEG file viewer and camera App. <input type="checkbox"/> NAND Flash file system <input type="checkbox"/> Keypad 5x5 <input type="checkbox"/> Voice memo support 	<p>ALPHA 2 (Oct15,'05)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Partial GSM memory optimization <input type="checkbox"/> Security (IMEI protection & ME personalization). <ul style="list-style-type: none"> ✓ Network Lock ✓ Subset lock ✓ Service provider Lock ✓ SIM lock ✓ Multiple Network Personalisation <input type="checkbox"/> GSM memory optimization <input type="checkbox"/> MIDI 32 <input type="checkbox"/> USB/NAND Flash mass storage activation to be controlled by compiler flag. 	<p>Alpha 3 (Nov. 15,'05)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Audio Improvements <ul style="list-style-type: none"> ✓ Noise Reduction (ANR V2.13). ✓ Downlink equalization Filter (IIR V4.0) ✓ AGC V1.0 (Automatic Gain Control) ✓ Acoustic Echo Canceller V2.0 (Step Size Control) ✓ DRC 1.0 (Dynamic Range Compression for Speech) <input type="checkbox"/> TTY over HR, FR & AMR <input type="checkbox"/> MP3 Ringer with WCM post processing. <input type="checkbox"/> Power Management Opt <input type="checkbox"/> Mirror bit Flash support <input type="checkbox"/> Bluetooth stack and profiles. (SPP(DUN), OBEX, GOEP,OPP, FTP Server, HFP,HSP, BIP, BPP) <input type="checkbox"/> Memory Opt: <ul style="list-style-type: none"> ✓ ACI Phone Book ✓ Additional optimizations to reach 2.5Mb 	<p>Final Alpha (Jan 31'06)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Memory Opt. <input type="checkbox"/> AAC player <input type="checkbox"/> Upgrade to Nucleus 1.15 <input type="checkbox"/> LNA reuse for different band <input type="checkbox"/> GPRS CI10 R97 <input type="checkbox"/> WCP profiler <input type="checkbox"/> USB modem/trace multiplexed <input type="checkbox"/> DRP update <p>Alpha Patches Feb15' 06: TTY BER bug fix Mar 15' 06: SAIC for GSM Alpha Release</p>
			<p>BETA (Apr 28' 06)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Validated SW delivery with Bug fixing <input type="checkbox"/> SAIC completely validated.

All dates are release dates to TI Soldel team

Making **Wireless**

SYSTEM TEST PLAN

Making **Wireless** System Validation Milestones LoCosto Lite

S/W baseline: TCS3.2.x

Milestone-1 (completion 31st of December)
(Alpha3 SW release date 15th of November)
I-Sample 1.1 (HW performed on 2.0)

Milestone-2 (completion 31th of March)
(Final Alpha SW release 31st of January)
I-Sample 2.1

Milestone-3 (completion 28th of April)
(Final Alpha release + Bug fixes / Modem Beta)
I-Sample 2.1

Reports

FTA - GCF and GSM only 95%
IOT GSM only 95% at Ericsson, Nortel and Alcatel
FT 90% @ Europe, India

FTA - GCF and GSM only 100%
IOT GSM only 100% at Ericsson, Nortel and Alcatel
FT > 90% @ Europe, Asia, America

FTA > 98%, Rob > 95%
IOT > 95% @ Main Lab + 2
FT > 95% @ Europe, Asia, America

Making **Wireless** System Validation Milestones LoCosto+

S/W baseline: TCS3.2.x

Milestone-1 (completion 7th of October)
(Alpha1 SW released 31st of August)
I-Sample 1.1

Milestone-2 (completion 25th of November)
(Alpha2 SW release Date 15th of October)
I-Sample 1.1

Milestone-3 (completion 31st of December)
(Alpha3 SW release date 15th of November)
I-Sample 1.1 (HW performed on 2.0)

Milestone-4 (completion 28th of February)
(Final Alpha SW release 31st of January)
I-Sample 2.1

Milestone-5 (completion 28th of April)
(Final Alpha release + Bug fixes / Modem Beta)
I-Sample 2.1

Milestone-6 (completion 30th June)
(ER1 release + Bug fixes 28th of April)
I-Sample 3.0

Milestone-7 (completion 15th September)
(ER2 release + Bug fixes 30th of June)
I-Sample 3.0

Milestone-8 (completion 15th November)
(Final release 29th of September)
I-Sample 3.0

Reports

FTA >50%, ROB >50% (Quick Test)
IOT --% @ Main Lab
FT --% @ Europe

FTA >50%, Rob >50%
IOT 50 % @ Main Lab + 1
FT 50% @ Europe + US

FTA 95%, Rob > 90%
IOT > 70% @ Main Lab + 2
FT 90% @ Europe, US, India

FTA > 95%, Rob > 95%
IOT > 90% @ Main Lab + 2
FT > 90% @ Europe, Asia, America

FTA > 98%, Rob > 95%
IOT > 95% @ Main Lab + 2
FT > 95% @ Europe, Asia, America

FTA > 98%, Rob > 95%
IOT > 95% @ Main Lab + 2
FT > 95% @ Europe, Asia, America

FTA > 98%, Rob > 95%
IOT > 95% @ Main Lab + 2
FT > 95% @ Europe, Asia, America

FTA > 98%, Rob > 95%
IOT > 95% @ Main Lab + 2
FT > 95% @ Europe, Asia, America