Commonly Asked Questions (20140206)

Q: Will the not-yet-tested ADC registers be listed so we can try it out for ourselves?
A: Listing untested function in released documentation will create problems for us. We'll see if there are other approaches.

Q: Will NavSpark be available after the Indiegogo campaign?
A: Yes, will be made available after a NavSpark webpage is setup later this month, but at none Indiegogo promotional price. Please see end of this Commonly Asked Questions document for reference.

Q: Would Arduino library have support for adapter board read/write of microSD card & checking the battery voltage?
A: We've used open-source code to access SD-card before. We'll have to see how to facilitate users to access SD card but avoid getting us into carrying the responsibility of fixing any SD-card compatibility issue that arises. GPS chipsets do not have ADC. Yet we dropped in one during design of Venus8, but never had time to verify its performance yet; thus cannot promise anything about measurement of battery voltage on the Adapter Board, although circuit will be connected. Instead, we'll use a 3-pin reset supervisor, allowing GPIO reading if battery is below a certain threshold, which is set by 2 resistors to the reset supervisor input.

Q: Is the battery charger both Li-PO and Li-ion compatible?
A: SC806 charger IC is used. It charges both Li-Ion and Li-Polymer.
http://www.semtech.com/selector/index.html?ver=PMICs&id=1.7

Q: Can COCOM limit be removed for NS-RAW in hobby rocket applications?
A: SkyTraq tries to provide best in class performance for consumer grade GPS/GNSS. Applications exceeding COCOM limit are not intended applications. We don't know nor have resource & means to ensure receiver performance under those extreme conditions. As each launch is costly and requires considerable planning, it is best for the other GPS/GNSS chipset companies > 20 times our size, which have resource and means to verify their receiver performance under such conditions, to support these rare uses.

The COCOM limit is: (18km altitude) and (1000knot or 515m/sec speed) must not be both exceeded simultaneously or the GPS will not give valid result; it'll still work correctly if either is exceeded. Thus if speed is Mach 1 (340m/sec) and goes up to 80km altitude, as it's still within COCOM limit there will not be software imposed limit making GPS not work.

Q: Is it possible to choose multiple perks at once?
A: Indiegogo doesn't seem to support this. One can contribute total amount for the perks wanted, chose one of the perks, fill the needed information, and drop us a private comment stating what other perks chosen to go with the contributed amount.

Q: How open is the Venus 8 chip on these boards going to be to tinkering? Will I be able to use GRMON (debug/flash tool?) on these chips and if I did flash it with something else, would I be able to restore the boot loader, and would a hardware programmer of some kind be required?
A: Other than GPS/GNSS register description that won't be opened, the LEON3 description is already available on Gaisler Research's website, we need to make available the function and register description of other on-chip peripherals (UART, SPI, I2C, GPIO, watchdog,…) and the mapping address for memory and peripherals. The GRMON needs a USB key costing thousands of dollars. We have no pin-out to support GRMON on Venus822. In case user application hangs, one can put a jumper to boot up in ROM mode to reload new Flash code; there is no additional hardware programmer to purchase.

Q: Does NAvSpark have position-hold mode for 1 satellite 1PPS generation?
A: Regarding GPS with position-hold mode for 1 satellite precision 1PPS generation, as far as I know, only SkyTraq's Venus638LPx-T, ublox' LEA-4T / 5T / 6T & NEO-6T, Trimble's Resolution T, iLotus' M12M Timing Oncore, and NavSync's CW-25 TIM are precision timing mode receivers with such feature. All the $40 ~ $60 SirfstarIV, ublox-6Q / 7Q GPS shields selling on hobbyist sites are normal GPS receiver modules for navigation & tracking application, they are not precision timing receiver type and do not have position-hold 1PPS generation feature. They are no different from NavSpark, all without this feature.

Q: I was told previous Venus GPS chipsets have been poor at maintaining lock in a model rocket flight. Will this current generation Venus work any better in this application?
A: Poor GPS performance unable to maintain lock could be due to poor antenna design. When using small antenna, signal gets weaker, and could unlocked more easily under rocket launch acceleration; it might not necessarily be issue of GPS chipset/module itself. We've seen cases of customer complaints on poor GPS performance with products using other brand chipset, when it's poor product design causing bad performance, nothing to do with GPS chipset itself.
More than 99% of our shipments are GPS chipset or GPS module, they are without antenna. It's no easy to assess if the situation mentioned is due to poor GPS performance or poor antenna selection or other issue. Modern day GPS chipset/module performance are not too much different, they all can withstand 4G acceleration and provide continuous fix. I don't suspect there is fundamental issue with our GPS handicapping it for hobby rocket use. The possibility of application issue is higher.

Q: Is there a datasheet for Venus 8?
A: The Venus822 on board NavSpark = LEON3 Sparc-V8 + FPU + memory + peripherals. All LEON3 Sparc-V8 & FPU details can be found in section 69 of GRIP document. What we need to add to the existing Venus822 datasheet are the memory map and peripheral register control descriptions, which will be made available on the day we ship.

GRIP/LEON3: http://t.cn/8FbovJT
Venus822: http://t.cn/8Fboh6t

Q: What is memory space left for user application?
A: Current NavSpark, NavSpark-GL, NavSpark-BD has about 490/45, 420/20, 440/10 Kbyte Flash/RAM available for user application. The user space will be larger if we later could have time to optimize.

Q: How is user code and interrupt services handled? What's the effect on other programs that need interrupts?
A: User code resides in a function that main() will call. There is no RTOS, just the GPS/GNSS interrupt service routine and the background main() loop. The application code should be written in the form of do some action if some event is detected, so as not to block the background main() function from looping continuously. Since the GPS/GNSS kernel code is partition into an interrupt service routine and a background function called by the main() function, transparent to the user; so long as the user application doesn't block the main() function looping, it will appear having user code and GPS/GNSS running concurrently.

As GPS/GNSS interrupt is 1msec, of higher priority, and occasionally could use up major portion of the 1msec interval, NavSpark cannot provide guaranteed fixed response time interrupt service while GPS/GNSS is running. With the other bare library without GPS/GNSS that we'll provide, users have 100% control of the processor and can better manage its interrupt behavior.

Q: How many channels is NavSpark, NavSpark-GL, NavSpark-BD and what's the expected TTFF?
A: Venus 8 is a 167 channel device. Average TTFF under open sky is around 30 seconds. GPS has ephemeris data in sub-frame 1~3 of the 5 cyclic sub-frames that needs to be collected from the signal in order to compute position, sub-frames are 6 seconds each, valid for up to 4 hours once collected. So with GPS best TTFF is 18 ~ 30 seconds assuming instant signal acquisition and depending on starting time of the receiver relative to the 30 second periodic sub-frames; 18 seconds TTFF if started at beginning of sub-frame 1 and able to get fix immediately after collecting last needed sub-frame 3 data (6x3=18); 30 second ~ 18 seconds if receiver is started anywhere between beginning of sub-frame 4 ~ end of sub-frame 5. And if GPS receiver is started anywhere between beginning of sub-frame 1 and end of sub-frame 3, another round over next cyclic 30sec sub-frame period is needed to fully collect the sub-frame 1~3 data, so TTFF is at best 30seconds. GLONASS has different ephemeris

duration. With GPS/GLONASS, open sky TTFF can sometimes be 10sec or 30sec; also depending on starting time of the receiver relative to the 30 second periodic sub-frames.

Q: Will the NavSpark be suitable for high altitude ballooning? How is COCOM limit implemented?
A: Either of 18km altitude or 1000knot speed threshold can be exceeded and it'll still work. If both simultaneously exceeded then it'll not give valid results.

Q: Is there any reason why you can't configure the Navspark / Narspark-GL / Navspark-BD to output the same data as the NS-RAW?
A: It's mainly market segmentation issue, similar to software companies having different price bundles for a product, although they could have offered all-encompassing features for the lowest price model as there is no difference in production/distribution cost (there is different engineering efforts in development though). Take Microsoft Office or LinkedIn for example. ☺

Q: As it's mentioned NavSpark is good for outdoor clock use, does NavSpark supports "position-hold" mode for timing?
A: Signal traveling from GPS satellite to earth is about 70msec. With just one GPS signal with sufficient signal strength to decode the data bits, the GPS receiver can determine time with error less than distance variations between zenith and horizon position if accounting this signal traveling time difference, if not then within 100msec error. For an outdoor clock that only shows hours, minute, second, this within 100msec accuracy time without ever needing to time adjust is pretty good.

NavSpark doesn't have precision timing mode receiver features of TRAIM, self-survey mode and single-sat precision 1PPS timing generation features. SDK for standard navigation, tracking application is integrated into the Arduino IDE; it has same feature as those $40 ~ $60 GPS receivers selling on hobby electronics sites, but with unprecedented major feature of SkyTraq's $199 SDK put into form of Arduino IDE.

Q: What is operating voltage of NavSpark? Does it support 5V?
A: NavSpark is 3.3V +/-10% type. It has 2 Schottky diodes in parallel, taking input from USB 5V interface and battery input, with outputs going into a 3.3V output LDO regulator to power the circuitry. The I/O is also 3.3V type, does not work with 5V.

Q: Can I get 1pcs Adapter Board?
A: Actually we're giving 2 for the price of 1 in this Indiegogo campaign. ☺

Q: What is highest accuracy attainable with NavSpark?
A: Accuracy is related to number of satellites and its orientation, varies through different time of day as satellites has approx. 12hr orbit, different location on earth also see different satellite situations…Thus it's difficult to say what the best accuracy achievable for end user is. For NavSpark, we can say that it provides standard average accuracy of 2.5m CEP 50%, as good as any SiRF, MTK, ublox GPS receiver modules on the market.

Q: Will NavSpark-GL or NavSpark-BD perform better than NavSpark in US?
A: Under urban canyon or heavy signal attenuated environment, dual-satellite navigation receiver may give better accuracy due to more satellite measurements available. Outside Asia, one will see more GLONASS signal than Beidou signals, since latter is not yet fully deployed yet. So NavSpark-GL may perform better than navSpark-BD under adverse condition in Canada.

Q: Why won't you make another perks where you it contains 1 NavSpark-GL and 1 NavSpark-BD?
A: For people wanting GL + BD, there's $22 GL + $22 BD perk available. It helps keep easy counting on rough number of people interested in GPS, GLONASS, and Beidou.

Q: What sources will be open?
A: NavSpark board hardware design and customized Arduino IDE source will be released at time of shipment. The GPS/GNSS library will not be open sourced; it'll be provided in library format only.

Q: Is Galileo supported?
A: The RFIC used doesn't support Galileo. All GPS/GNSS modules on the market claiming Galileo-capable likely will be superseded by their next-generation solution when there are enough Galileo satellites, those companies unlikely will have resource to develop code for an older chip. Some may have experience with xxxxx-5 Galileo capable solution, which is already phased out by latest Galileo capable xxxxx-8 solution, yet no consumer ever saw Galileo reception on any earlier models. Such marketing claim is to be taken with grain of salt.

Q: What is the current consumption?
A: Current consumption for initial full power signal acquisition and fully tracked navigation for NavSpark, NavSpark-GL, NavSpark-BD is roughly 38/30, 45/40, 45/40 mA at 3.3V using on-chip DC/DC switching regulator.

Q: NavSpark-GL and NavSpark-BD, which is better choice?
A: navSpark-GL will see more satellites, due to 24 globally orbiting MEO GLONASS satellites. Beidou is not fully deployed yet, only 5 globally orbiting MEO satellite, 6 geostationary and 5 inclined geostationary satellites over Asia.

Q: Can NavSpark receiver handing simultaneous reception of GPS+GLONASS+Beidou?
A: Venus8 baseband hardware is designed to handle GPS/Galileo, GLONASS, Beidou signals from 3 IF signal paths concurrently, yet there's only GPS + GLONASS or GPS + Beidou 2 IF paths RFIC available, thus we're unable to have solution processing all 3 signals concurrently yet.

Q: How is NS-RAW centimeter-level accuracy achieved?
A: NS-RAW acts as a GPS measurement sensor, sending out measurement data to a host computer running RTK software such as open-source RTKLIB. RTKLIB takes correction data from some reference station and takes measurement data from NS-RAW, compute NS-RAW's location, resolving carrier cycle ambiguity to determine position to fraction of a wavelength; i.e. fraction of 19cm = 3e10/1575.42MHz. Conventional GPS receiver determines position to fraction of a chip (1023 chip in 1millisecond); fraction of 300 meters, so conventional GPS is about 3m accuracy.

Q: How to use RTKLIB?
A: The RTKLIB website, especially the RTKLIB document, has sufficient information on how to properly setup and run using low cost GPS receiver. NS-RAW is compatible to S1315F-RAW mentioned in the RTKLIB document. There is also a forum with much discussion on RTKLIB below for reference:
http://www.rtklib.com/
http://t.cn/8FG6RMr

Q: How much CPU is available for the user application while using NavSpark's highest 10Hz GPS update rate?
A: GPS has 1msec interrupt. 10Hz navigation routine runs on back ground, compute PVT solution every 100msec. NavSpark Venus 8 RISC/FPU has potential to do max of 50Hz update rate running at top speed, thus expect to have at least 50% throughput for user application when doing 10Hz GPS running at top speed.

Q: Will the NS-RAW version also output a PPS signal?
A: Yes.

Q: Will NavSpark have command set similar to TinyGPS?
A: Below is the document for our standard $199 GPS SDK, of which is the core GPS library going into ported Arduino. User can call it directly or through a wrapper API that makes it friendlier. All will be explained clearly in the document release. As GPS related information are native, there is no need for NMEA parser. Anyone can easily add a wrapper to have an API similar to some other GPS parser library he/she is using.

http://t.cn/8Fb1H3d

Q: How does this GPS receiver compare to others such as SIRF III and SIRF IV systems? How effective would it be for vehicle tracking where direct line of sight is not available (tracking device is hidden in the vehicle)?
A: For vehicle tracking where direct line of sight is not available, an experiment we did earlier is described here: http://t.cn/8FbZGIu

Venus 816 is ROM GPS chip. S1315F8 is Flash GPS module. Same as NavSpark, all are powered by SkyTraq's latest 55nm Venus 8 architecture. NavSpark (GPS) has similar circuit design as S1315F8, the former uses 7×7 Venus822 chip with extended I/O, the latter uses 5×5 Venus821 with little I/O for smaller size.

Q: Would it be better if the antenna is directly on board?
A: Despite being more compact, problem with antenna on board is that it then becomes the bottleneck on receiver performance; usually bigger the antenna, better the signal reception performance. Having RF connector allows user to choose different antenna according to their needs. The supplied internal active antenna will be 1"x1" type, 10cm length, ~28dB gain, current drain < 10mA. We are still deciding on the antenna supplier, will be something that looks like this: http://t.cn/8Fbz7t4

Q: Is WAAS supported?
A: Yes, QZSS and SBAS (WAAS, EGNOS, MSAS, GAGAN) are supported.

Q: What update rate is supported?
A: All NavSpark models support 1 / 2 / 4 / 5 / 8 / 10 Hz update rates. Note that when higher update rate is used, less MIPS will be available for user application.

Q: How accurate is the GPS?
A: GPS accuracy highly depends on signal condition. Accuracy under open sky is: 2.5m CEP position accuracy, 0.1m/sec speed accuracy, 10nsec time pulse accuracy.

	Indiegogo campaign period	after Indiegogo campaign
NavSpark 1pcs + internal active antenna * 1pcs + postal shipping	$19	
NavSpark-GL 1pcs + internal active antenna * 1pcs + postal shipping	$22	
NavSpark-BD 1pcs + internal active antenna * 1pcs + postal shipping	$22	
equivalent NS-RAW 1pcs + internal active antenna * 1pcs + postal shipping	$25	
equivalent micro-SD Holder with Battery Charger Adapter Board 1pcs + postal shipping	$6	
NavSpark 1pcs		$22
NavSpark-BD 1pcs		$25
NavSpark-GL 1pcs		$25
NS-RAW 1pcs		$80
micro-SD Holder + Battery Charger Adapter Board 1pcs		$12
internal active antenna 2pcs *		$15
SMA-to-UFL cable, 15cm, 4pcs		$10
external GPS/GLONASS/Beidou active antenna, 2.5 meter cable, SMA connector		$14
shipping & handling inside Taiwan		$5
postal shipping & handling outside Taiwan		$10
FedEx shipping & handling		$20
free postal shipping & handling for order > $50		
free FedEx shipping & handling for order > $100		
* internal 1"x1" ceramic patch GPS/GLONASS/Beidou active antenna, 10cm, UFL connector		