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Permanent Link to Consumer GPS/GLONASS: Accuracy and Availability Trials of a One-Chip Receiver in Obstructed Environments

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By Philip Mattos, STMicroelectronics R&D Ltd. A one-chip multiconstellation GNSS receiver, now in volume production, has been tested in severe urban environments to demonstrate the benefits of multiconstellation operation in a consumer receiver. Bringing combined GPS/GLONASS from a few tens of thousands of surveying receivers to many millions of consumer units, starting with satnav personal navigation devices in 2011, followed by OEM car systems and mobile phones, significant shifts the marketplace. The confidence of millions of units in use and on offer should encourage manufacturers of frequency-specific components, such as antennas and SAW filters, to enter volume mode in terms of size and price. One-chip GPS/GLONASS receiver trials in London, Tokyo, and Texas sought to demonstrate that the inclusion of all visible GLONASS satellites in the position solution, in addition to those from GPS, produces much greater availability in urban canyons, and in areas of marginal availability, much greater accuracy. Multi-constellation receivers are needed at the consumer level to make more satellites available in urban canyon environments, where only a partial view of the sky is available and where extreme integrity is required to reject unusable signals, while continuing to operate on other signals deeply degraded by multiple reflection and attenuation. This article briefly outlines the difficulties of integrating a currently non-compatible system (GLONASS), offering an economic solution in the mass market where cost is king, but performance demands in terms of low signal, power consumption, time-to-first-fix, and availability are extreme. While the accuracy achieved is not at survey levels, we deem it sufficient to meet consumer demands even at the worst signal conditions. The aim is to provide improved indoor and urban canyon availability for mass-market GNSS by using all available satellites; in 2011, that requires GLONASS support, as the constellation availability precedes Galileo by around three years. The aim is to overcome the hardware incompatibility issues of GLONASS, that is, its frequency division multiple access (FDMA) signal rather than the code division multiple access format used by GPS, different centre frequency, and different chipping rate, all without adding significantly to the silicon cost of the receiver chipset. This then allows a total satellite constellation of about 50 to be used at present, even before two recently launched Galileo IOV satellites. It is expected that in benign conditions

the additional satellites will give little benefit, as availability approaches 100 percent, and accuracy is excellent, with GPS alone. Though dominated by the ionosphere, using seven, eight, or nine satellites in the fix minimises the amount of error that feeds through to the final position. In marginal conditions, where GPS can give a position, but is using 3/4/5 satellites and those are clustered in the narrow visible part of the sky resulting in poor DOP values, the increased number of satellites benefits the accuracy greatly, due to both improved DOP and multipath-error averaging. Limited satellites mean the full multipath errors map into position and are magnified by the DOP. Adding the second constellation means more clear-view satellites for accuracy, more total satellites to minimise the errors, and the errors are less magnified by the geometry due to better DOP. In extreme conditions, where insufficient GPS satellites are seen to give a fix, the additional GLONASS satellites increase the availability to 100 percent (excluding actual tunnels). Availability is a self-enhancing positive feedback loop... if satellites are always tracked, even if rejected on a quality basis by the RAIM/fault detection and exclusion (FDE) algorithms, then they do not need to be reacquired, so become available for use earlier. If position can be maintained, then the code phases for obstructed satellites can continue to be predicted accurately, allowing instant reacquisition after obstruction, and instant use as no code pull-in time is required. Once availability is lost, the reverse applies, as wrong position means worse prediction, longer reacquisition, and hence again less availability. The extra visible satellites are very significant for the consumer, particularly — as for example with self-assistance where the minimum constellation is five satellites, not three to four — to autonomously establish that all satellites are healthy using receiver-autonomous integrity monitoring (RAIM) methods. Self-assistance has further major benefits for GLONASS, in that no infrastructure is required, so there will be no delay waiting for GLONASS assistance servers to roll out. The GLONASS method of transmitting satellite orbits is also very suitable for the self-assistance algorithm, saving translation into and out of the Kepler format. Significance of Work Previous attempts to characterize the multi-constellation benefits in urban environments have been handicapped by the need to use professional receivers not designed for such signal conditions, and by the need to generate a separate result for each constellation or sacrifice one satellite measurement for clock control. These problems made them unrepresentative of the performance to be expected from the volume consumer device. This new implementation is significant in being a true consumer receiver for high sensitivity, fully integrated both for measurement and for computation. Thus fully realistic trials are reported for the first time. Background The tests were performed on the Teseo-II single chip GNSS receiver (STA-8088). A brief history: our 2009 product Cartesio+ already included GPS/Galileo, and the digital signal processor (DSP) design has been extended to include GLONASS also for Teseo2, the 2010 product. Test results with real signal data through FPGA implementations of the baseband started in late 2009, and with the full product chip in 2010. The architectural design showed that the silicon could be implemented with only small additional silicon area. Changes to the baseband DSP hardware and software were small and were included in the next scheduled upgrade of the chip, Teseo2. The RF chip silicon requires much greater attention, duplicating the intermediate frequency (IF) path and analog-digital converter (ADC), with additional frequency conversion and a much wider IF filter

bandwidth; however, as the RF silicon area is very small in total, even a 30 percent increase here is not a significant percentage increase on the whole chip. As the design is for an integrated single chip system (RF and baseband, from antenna to position, velocity, and timing (PVT) solution), the overall silicon area on a 65-nanometer process is very small. Commercially, it is new to include all three constellations in a single consumer chip. Technically it is new to use a pool of constellation-independent channels for GLONASS, though standard for GPS/Galileo. Achieving this flexibility has also required new techniques to manage differing RF hardware delays, different chipping rates, in addition to the coordinated universal time (UTC) offset and geoid offset problems already well known to the surveying community. It is also very unusual to go direct to a single-chip solution (RF+baseband+CPU) for such a major technology step. The confidence for this step comes from the provenance of the RF and the baseband, the RF being an extension of the STA5630 RF used with Cartesio+, and the baseband being significant but not major modifications of the GPS/Galileo DSP used inside Cartesio+. 5630/Cartesio+ were proven in volume production as separate chips before the single-chip three-constellation chip starts production. The steps forward from the previous generation of hardware are on chip RF, Galileo support, GLONASS support. While Galileo can pass down the existing GPS chain, with appropriate bandwidth changes, additional changes are required for GLONASS: see Figures 1 and 2. Figure 1. RF changes to support GLONASS. Figure 2. Baseband changes to support GLONASS. In the RF section, the LNA, RF amp, and first mixer are shared by both paths, in order to save external costs and pins for the equipment manufacturer, and also to minimize power consumption. Then the GLONASS signal, now at around 30 MHz, is tapped off into a secondary path shown in brown, mixed down to 8 MHz and fed to a separate ADC and thus to the baseband. In the baseband, an additional pre-conditioning path is provided, again shown in brown, which converts the 8 MHz signal down to baseband, provides anti-jammer notch filters, and reduces the sample rate to the standard 16fs expected by the DSP hardware. The existing acquisition engines and tracking channels can then select whether to take the GPS/Galileo signal, or the GLONASS signal, making the allocation of channels to constellations completely flexible. Less visible but very important to the system performance is the software controlling these hardware resources, first to close tracking loops and take measurements, and secondly the Kalman filter that converts the measurements to the PVT data required by the user. This was all structurally modified to support multiple constellations, rather than simply adding GLONASS, in order that future extensions of the software to other future systems becomes an evolutionary task rather than a major re-write. The software ran on real silicon in 2010, but using signals from either simulator or static roof antennas, where accuracy and availability of GPS alone are so good that there is little room for improvement. In early 2011, prototype satnav hardware using production chips, antennas, and cases became available, making mobile field trials viable. Actual Results Results have already been seen from trials using professional receivers with independent GPS and GLONASS measurements. However, those tests were not representative of the consumer receiver because they are not high sensitivity; because the receivers require enough clean signal to operate a PLL, which is not realistic in a mobile city environment; and because they were creating two separate solutions, thus needing a continuous extra satellite to resolve inter-

system time differences. A 2010 simulation of visible satellites in a typical urban canyon of downtown Milan, Italy, produced the results, every minute averaged for a full 24 hours, shown in Table 1. The average number of satellites visible rises from 4.4 with GPS alone, to 7.8 for GPS+GLONASS, with the result that there are then zero no-fix samples. With GPS alone there were 380 no-fix samples, or 26 percent of the time. Table 1. Accuracy and availability of GPS and GPS+GLONASS, averaged over 24 hours. However, availability is not itself sufficient. Having more satellites in the same small piece of sky above the urban canyon may not be sufficient, due to geometric accuracy limitations. To study this, the geometric accuracy represented by the HDOP was also collected, and shows an accuracy 2.5 times better. Previous studies suggested that in the particular cities tested, two to three additional satellites were available, but one of these was wasted on the clock solution. Using the high-sensitivity receiver, we expected four or five extra satellites and none wasted. The actual results far exceeded our expectations. Firstly, many more satellites were seen, as all previous tests and simulations had excluded reflected signals. Having many more signals, the DOP was vastly improved, and the effect of the reflections on accuracy was greatly reduced, both geometrically, and by the ability of the FDE/RAIM algorithms to maintain their stability and down-weight grossly erroneous signals rather than allow them to distort the position. The results presented here are from a fully integrated high-sensitivity receiver optimized to use signals down to very low levels, and to give a solution derived directly from all satellites in view, no matter which constellation. This produces 100 percent availability, and much improved accuracy in the harsh city environment. Availability The use of high-sensitivity receivers, not dependent on phase-locked loops (PLLs) for tracking, produces 100 percent availability in modern cities, even high-rise, due to the reflective nature of modern glass in buildings, even for GPS alone. Thus some other definition of availability is required rather than "four sats available," such as sats tracked to a certain quality level, resulting in a manageable DOP. Even DOP is difficult to assess, as the Kalman filter gives different weights to each satellite, not considered in the DOP calculation, and also uses historic position and current velocity, in addition to instantaneous measurements, to maintain the accuracy of the fix. Figure 3 shows the availability of tracked satellites in tests in the London City financial district in May 2011. As can be seen, there are generally seven to eight GLONASS satellites and eight to nine GPS satellites, for a total of around 16 satellites. The only period of non-availability was in a true tunnel (Blackfriars Underpass) at around time 156400 seconds. In other urban canyons, around time 158500 and 161300, individual constellations came down to four satellites, but the total never fell below eight. Note this is an old city, mainly stone, so reflections are limited compared with glass/metal buildings. While outside tunnels, availability is 100 percent, this may be limited by DOP or accuracy. As can be seen in Figure 4 on another London test, the GNSS DOP remains below 1, as might be expected with 10-16 satellites, while GPS-only frequently exceeds four, with the effect that any distortions due to reflections and weak signals are greatly magnified, with several excursions over 10. Figure 4. GPS-only versus combined GPS/GLONASS dilution of precision. As the May 2011 tests had not been difficult enough to stress the GPS into requiring GNSS support, a further trial was performed in August 2011. This was in a modern high-rise section of the city, Canary Wharf, shown in Figure 5 on an aerial photograph. In addition to being

high-rise, the roads are also very narrow, resulting in very difficult urban canyons. Being a modern section of the city, the buildings are generally reflective glass and metal, rather than stone, testing RAIM and FDE algorithms to the extreme. Figure 5. GPS versus GNSS, London Canary Wharf (click to enlarge.) This resulted in difficulty for the GPS-only solution, shown in green, especially in the covered section of the Docklands station, center-left, lower track. Figure 6 shows the same test data displayed on truth data taken from the Ordnance Survey vector map data of the roads. Figure 6. GPS versus GNSS, London Canary Wharf, on vector truth (click to enlarge.) The blue GNSS data is then extremely good, especially on the northern (eastbound) part of the loop (UK drives on the left, thus one-way loops are clockwise). Further tests were carried out by ST offices around the world. Figure 7 shows a test in Tokyo, where yellow is the previous generation of chip with no GLONASS, red was Teseo-II with GPS plus GLONASS. Figure 7. Teseo-I (GPS) versus Teseo-II (GNSS) in Tokyo test. Again, here the scenario is not sufficiently challenging to hurt the availability even of GPS alone, but the accuracy is limited. Figure 8 gives some explanation of the accuracy problems, by showing the DOP during the test. It can be seen that Teseo-II DOP was rarely above 2, but the GPS-only version was between 6 and 12 in the difficult northern part of the test, circled for illustration. Figure 8. DOP during Tokyo tests (click to enlarge.) Further Tokyo tests were performed entering the narrower urban canyons in the same test area, shown in Figure 9. Blue is GPS only, red is GPS+GLONASS, and the major improvement is obvious. Figure 9. GPS only (blue) versus GNSS (red), Tokyo. Figure 10 uses the same color scheme to illustrate tests in Dallas, this time with a competitor's GPS receiver versus Teseo-II configured for GPS+GLONASS, again a huge benefit. Figure 10. GPS only (blue, competitor) versus GNSS (red), Dallas. Other Constellations While Teseo-II hardware supports Galileo, there are no production Galileo satellites available yet (September 2011), so the units in the field do not have Galileo software loaded. However, the Japanese QZSS system has one satellite available, transmitting legacy GPS-compatible signals, SBAS signals, and L1C BOC signals. Teseo-II can process the first two of these, and while SBAS is no benefit in the urban canyon as the problems of reflection and obstruction are local and unmonitored, the purpose of QZSS is to provide a very high-angle satellite, so that it is always available in urban canyons. Figure 11 shows a test in Taipei (Taiwan) using GPS (yellow) versus GPS plus one QZSS satellite in red, with the truth data shown in purple. Figure 11. GPS only (yellow) versus GPS+QZSS(1 sat, red), truth in purple, Taipei (click to enlarge.) Further Work The test environment will be extended to yield quantitative accuracy results for UK tests where we have the vector truth data for the roads. The hardware flexibility will be extended to support Compass and GPS-III (L1-C) signals, in addition to Galileo already supported. Acquisition and tracking of these signals have already been demonstrated using pre-captured off-air samples. In 2010, the Compass spec was not available. Thus the Teseo-II silicon design was oriented to maximum flexibility in terms of different code lengths, such as BOC or BPSK, so that by using software to configure the hardware DSP functions, the greatest chance of compatibility could be achieved. The result was only a marginal success, in that the 1561 MHz frequency of the regional Compass system can only be supported using the flexibility of the voltage-controlled oscillator and PLL, meaning that it cannot be supported at the same time as other constellations. Additionally, the code rate on the regional system is also 2 M chips/second, which is not supported, so

is approximated by using alternate chips, producing serious signal loss. So the hooks for Compass are only useful for research and software development, either for a single-constellation system, or using a separate RF front end. The worldwide Compass signal, which is on a GPS/Galileo signal format in both carrier frequency and in code length and rate, will be directly compatible, but is not expected to be fully available until 2020. The city environment testing will be repeated as the Galileo constellation becomes available. With 32 channels, an 11/11/10 split (GPS/Galileo/GLONASS) may be used when all three constellations are full, but for the next few years 14/8/10 satisfies the all-in-view requirements. Conclusions The multi-constellation receiver can include GLONASS FDMA at minimal increased cost, and with its 32 channels tracking up to 22 satellites in a benign environment, even in the harshest city environment sufficient satellites are seen for 100 percent availability and acceptable accuracy. 10-16 satellites were generally seen in the urban canyon tests. The multiplicity of measurements allows RAIM and FDE algorithms to be far more effective in eliminating badly reflected signals, and also minimizes the geometric effects of remaining distortion on the signals retained. Acknowledgments ST GPS products, chipsets, and software, baseband and RF are developed by a distributed team in Bristol, UK (system R&D, software R&D); Milan, Italy (silicon implementation, algorithm modelling and verification); Naples, Italy (software implementation and validation); Catania, Sicily, Italy (Galileo software, RF design and production); and Noida, India (verification and FPGA). The contribution of all these teams to both product ranges is gratefully acknowledged. Philip Mattos received a master's degree in electronic engineering from Cambridge University, UK, a master's in telecoms and computer science from Essex University, and an external Ph.D. for his GPS work from Bristol University. He was appointed a visiting professor at the University of Westminster. Since 1989 he has worked exclusively on GPS implementations and associated RF front ends, currently focusing on system-level integrations of GPS, on the Galileo system, and leading the STMicroelectronics team on L1C and Compass implementation, and the creation of generic hardware to handle future unknown systems.

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gps tracking device signal jammer half	4325	7018	4388

Asante ad-121200au ac adapter 12vac 1.25a used 1.9 x 5.5 x 9.8mm,belkin car cigarette lighter charger for wireless fm transmitter,dve dsc-6pfa-05 fus 050100 ac adapter +5v 1a used -(+)- 1x3.5mm.texas instruments 2580940-6 ac adapter 5.2vdc 4a 6vdc 300ma 1.jobmate ad35-04503 ac adapter 4.5vdc 300ma new 2.5x5.3x9.7mm,chicony cpa09-002a ac adapter 19vdc 2.1a samsung laptop powersup,prudent way pw-ac90le ac adapter 20vdc 4.5a used -(+) 2x5.5x12mm.with a maximum radius of 40 meters,coonix aib72a ac adapter 16vdc 4.5a desktop power supply ibm,ibm aa21131 ac adapter 16vdc 4.5a 72w 02k6657 genuine original,nokia no5100 6100 car power adapter 1x3.5mm round barrel new cha,acbel ad9014 ac adapter 19vdc 3.42a used -(+)- 1.8x4.8x10mm.shopping malls and churches all suffer from the spread of cell phones because not all cell phone users know when to stop talking,tec rb-c2001 battery charger 8.4v dc 0.9a used b-sp2d-chg ac 100,ad-187 b ac adapter 9vdc 1a 14w for ink jet printer.li shin lse0107a1240 ac adapter 12vdc 3.33a -(+)- 2x5.5mm 100-24,gateway liteon pa-1900-04 ac adapter 19vdc 4.74a 90w used 2.5x5.,top global wrg20f-05ba ac adapter 5vdc 4a -(+)- 2.5x5.5mm used,this paper describes different methods for detecting the defects in railway tracks and methods for maintaining the track are also proposed,hipower ea11603 ac adapter 18-24v 160w laptop power supply 2.5x5.cool-lux ad-1280 ac adapter 12vdc 800ma battery charger,csi wireless sps-05-002 ac adapter 5vdc 500ma used micro usb 100,eng 3a-122du12 ac adapter 12vdc 1a -(+) 2x5.5mm used power suppl.compaq pa-1900-05c1 acadapter 18.5vdc 4.9a 1.7x4.8mm -(+)- bul.by activating the pki 6100 jammer any incoming calls will be blocked and calls in progress will be cut off,silicore sld80910 ac adapter 9vdc 1000ma used 2.5 x 5.5 x 10mm.car power adapter round barrel 3x5.5mm used power s.cs-6002 used ac grill motor 120vac 4w e199757

214624 usa canada,handheld powerful 8 antennas selectable 2g 3g 4g worldwide phone jammer &a leader in high-precision gnss positioning solutions.but communication is prevented in a carefully targeted way on the desired bands or frequencies using an intelligent control.now we are providing the list of the top electrical mini project ideas on this page.ancon 411503003ct ac adapter 15vdc 300ma used -(+)- rf antenna co, hp 384021-001 compaq ac adapter 19vdc 4.7a laptop power supply, bogen rf12a ac adapter 12v dc 1a used power supply 120v ac ~ 60h, panasonic de-891aa ac adapter 8vdc 1400ma used -(+)- 1.8 x 4.7 x, readynet e200k homeplug ethernet adapter used 200mbps connectivi, bellsouth dv-1250ac ac adapter 12vac 500ma 23w power supply. energy ea1060a fu1501 ac adapter 12-17vdc 4.2a used 4x6.5x12mm r, ibm 02k6749 ac adapter 16vdc 4.5a -(+) 2.5x5.5mm used 100-240vac, ault pw15aea0600b05 ac adapter 5.9vdc 2000ma used -(+)- 1.3x3.5mm. black & decker vpx0310 class 2 battery charger used 7.4vdc cut w, motorola psm4841b ac adapter 5.9vdc 350ma cellphone charger like, sanyo spa-3545a-82 ac adapter 12vdc 200ma used +(-) 2x5.5x13mm 9, but also completely autarkic systems with independent power supply in containers have already been realised. replacement pa3201u-1aca ac adapter 19vdc 6.3a power supply tosh. 3 x 230/380v 50 hz maximum consumption. nokia acp-7u standard compact charger cell phones adapter 8260,, panasonic cf-aa1653a ac adapter 15.6vdc 5a ite power supply cf-1, audiovox plc-9100 ac adapter 5vdc 0.85a power line cable. the pki 6160 covers the whole range of standard frequencies like cdma, dell ha65ns5-00 19.5v 3.34ma 65w ac adapter 4.8x7.3mm used, v test equipment and proceduredigital oscilloscope capable of analyzing signals up to 30mhz was used to measure and analyze output wave forms at the intermediate frequency unit. this also alerts the user by ringing an alarm when the real-time conditions go beyond the threshold values, nexxtech e201955 usb cable wall car charger new open pack 5vdc 1, the mechanical part is realised with an engraving machine or warding files as usual. atlinks 5-2633 ac adapter 5v 400ma used 2x5.5x8.4mm round barrel. 3com p48240600a030g ac adapter 24vdc 600ma used -(+)- 2x5.5mm cl, ac/dc adapter 5v 1a dc 5-4.28a used 1.7 x 4 x 12.6 mm 90 degree, here is a list of top electrical mini-projects, delta adp-5fh c ac adapter 5.15v 1a power supply europa. dve dsa-31fus 6550 ac adapter +6.5vdc 0.5a used -(+) 1x3.5x8.3mm. lei nu40-2120333-i3 ac adapter 12vdc 3.33v used -(+) 2.5x5.5mm 9, dve dsa-0101f-05 up ac adapter 5v 2a power supply, railway security system based on wireless sensor networks, whenever a car is parked and the driver uses the car key in order to lock the doors by remote control, briefs and team apparel with our online design studio. < 500 maworking temperature, mobile phone jammer market size 2021 by growth potential, viasat 1077422 ac adapter +55vdc 1.47a used -(+) 2.1x5.5x10mm ro. iona ad-1214-cs ac adapter 12vdc 140ma used 90° class 2 power su. building material and construction methods, landia p48e ac adapter 12vac 48w used power supply plug in class. nextar fj-t22-1202500v ac adapter 12v 250ma switching power supp. skynet dnd-3012 ac adapter 30vdc 1a used -(+)- 2.5x5.5mm 120vac, lintratek aluminum high power mobile network jammer for 2g. we would shield the used means of communication from the jamming range. microtip photovac e.o.s 5558 battery charger 16.7vdc 520ma class, max station xk-09-1041152 ac adapter 22.5v 2.67a power supply. southwestern bell freedom phone 9a200u-28 ac adapter 9vac 200ma, lenovo ad8027 ac adapter 19.5vdc 6.7a used -(+) 3x6.5x11.4mm 90, delta electronics adp-10ub ac adapter 5v 2a used -(+)- 3.3x5.5mm, st-

c-075-18500350ct replacement ac adapter 18.5v dc 3.5a laptop.

Nyko 87000-a50 nintendo wii remote charge station,or 3) imposition of a daily fine until the violation is [Mobile phone jammer for sale](#) ,kenwood dc-4 mobile radio charger 12v dc.ahead jad-1201000e ac adapter 12vdc 1000ma 220vac european vers.au 3014pqa switching adapter 4.9v 0.52a charger for cell phone 9,sagemcom s030su120050 ac adapter 12vdc 2500ma used -(+) 2.5x5.5mm.potrans up01011120 ac adapter +12vdc 1a power supply,lighton pb-1200-1m01 ac adapter 5v 4a switching ac power supply,power grid control through pc scada,sl waber ds2 ac adapter 15a used transiet voltage surge suppress.a break in either uplink or downlink transmission result into failure of the communication link,this was done with the aid of the multi meter.jvc ca-r455 ac adapter dc4.5v 500ma used 1.5 x 4 x 9.8mm,dual band 900 1800 mobile jammer,ak ii a15d3-05mp ac adapter 5vdc 3a 2.5x5.5 mm power supply,gateway2000 adp-45cb ac dc adapter 19v 2.4a power supply,nissyo bt-201 voltage auto converter 100v ac 18w my-pet,microsoft 1625 ac adapter 12vdc 2.58a used charger for surface p,go through the paper for more information,samsung aa-e7a ac dc adapter 8.4v 1.5a power supply ad44-00076a,ic-dsi171002 ac adapter 4.6vdc 900ma used usb connector switchin.ibm 02k6718 thinkpad multiple battery charger ii charge quick mu.insignia u090070d30 ac adapter 9vdc 700ma used +(-)+ 2x5.5mm rou,solex tri-pit 1640c ac adapter 16.5vac 40va 50w used screw termi.moso xkd-c2000ic5.0-12w ac adapter 5vdc 2a used -(+) 0.7x2.5x9mm,katana ktpr-0101 ac adapter 5vdc 2a used 1.8x4x10mm,acbel api1ad43 ac adapter 19v 4.74a laptop power supply.this tool is very powerfull and support multiple vulnerabilites.aps a3-50s12r-v ac adapter 15vdc 3.3a used 4 pin xlr female 100-.power-win pw-062a2-1y12a ac adapter 12vdc 5.17a 62w 4pin power,intelligent jamming of wireless communication is feasible and can be realised for many scenarios using pki's experience.aps ad-555-1240 ac adapter 24vdc 2.3a used -(+)- 2.5x5.5mm power.tpv adpc12416ab ac adapter 12v 4.16a acer notebook power supply.which makes recovery algorithms have a hard time producing exploitable results,amigo 121000 ac adapter 12vdc 1000ma used -(+) 2 x 5.5 x 12mm,new bright a865500432 12.8vdc lithium ion battery charger used 1,jabra acw003b-06u1 ac adapter used 6vdc 0.3a 1.1x3.5mm round,finecom 92p1156-auto dc to dc adapter 15 - 20vdc 3a universa cha,5g modules are helping accelerate the iot's development,canon cb-2lwe ac adapter 8.4vdc 0.55a used battery charger.this paper shows the controlling of electrical devices from an android phone using an app,lenovo 42t4426 ac adapter 20v dc 4.5a 90w used 1x5.3x7.9x11.3mm,toshiba pa3283u-1aca ac adapter 15vdc 5a - (+) - center postive,65w-dl04 ac adapter 19.5vdc 3.34a da-pa12 dell laptop power.accordingly the lights are switched on and off.motorola bb6510 ac adapter mini-usb connector power supply car c,hna050100u ac adapter 5v 1a audio video power supply.apd ne-17b512 ac adapter 5v 1.2a 12v 1a power supply i.t.e.sp12 ac adapter 12vdc 300ma used 2 pin razor class 2 power suppl.liteonpa-1121-02 ac adapter 19vdc 6a 2x5.5mm switching power.ppp014s replacement ac adapter 19vdc 4.7a used 2.5x5.4mm -(+)- 1,symbol r410506 ac adapter 4vdc 140ma used 24pin connector ptc-70,ar 48-15-800 ac dc adapter 15v 800ma 19w class 2 transformer,j0d-41u-16 ac adapter 7.5vdc 700ma used -(+)- 1.2 x 3.4 x 7.2 mm,it detects the transmission signals of four different bandwidths simultaneously.toshiba pa3743e-1ac3 ac adapter 19vdc 1.58a power supply adp-30j,ibm dcwp cm-2 ac

adapter 16vdc 4.5a 08k8208 power supply laptops,sceptre power amdd-30240-1000 ac adapter 24vdc 1a used -(+) 2x5..ac 110-240 v / 50-60 hz or dc 20 - 28 v / 35-40 ahdimensions.ite up30430 ac adapter +12v 2a -12v 0.3a +5v dc 3a 5pin power su.sino american sa106c-12 12v dc 0.5a -(+)- 2.5x5.5mm switch mode.black & decker vp131 battery charger used 4.35vdc 220ma 497460-0.delta electronics adp-36db rev.a ac power adapter ast laptop,hp 0950-3796 ac adapter 19vdc 3160ma adp-60ub notebook hewlett p.lenovo 92p1160 ac adapter 20v 3.25a power supply 65w for z60,nikon mh-71 ni-mh battery charger 1.2vdc 1a x2 used.simple mobile jammer circuit diagram cell phone jammer circuit explanation,ikea yh-u050-0600d ac adapter 5vdc 500ma used -(+) 2.5x6.5x16mm,sparkle power spa050a48a ac adapter 48vdc 1.04a used -(+)- 2.5 x,advent 35-12-200c ac dc adapter 12v 100ma power supply.electra 26-26 ac car adapter 6vdc 300ma used battery converter 9.li shin lse9802a1240 ac adapter 12v 3.3a 40w power supply 4 pin,nexxtech 2731413 ac adapter 220v/240vac 110v/120vac 1600w used m.anta mw57-1801650a ac adapter 18v 1.65a power supply class 2.lind automobile apa-2691a 20vdc 2.5amps ibm thinkpad laptop powe,infinite ad30-5 ac adapter 5vdc 6a 3pin power supply,the inputs given to this are the power source and load torque,condor hk-i518-a12 12vdc 1.5a -(+) 2x5.5mm used ite power supply,dve dsa-0151f-15 ac adapter 15vdc 1.2a 1200ma switching power su,apd da-48m12 ac adapter 12vdc 4a used -(+)- 2.5x5.5mm 100-240vac.macintosh m4328 ac adapter 24.5vdc 2.65a powerbook 2400c 65w pow,kodak k8500 li-on rapid battery charger dc4.2v 650ma class 2.

Finecom pa-1300-04 ac adapter 19vdc 1.58a laptop's power sup.oem aa-091a5bn ac adapter 9vac 1.5a used ~(~) 2x5.5mm europe pow,ryobi p113 class 2 battery charger 18v one+ lithium-ion batterie.globtek gt-21089-1305-t2 ac adapter +5vdc 2.6a 13w used -(+) 3x5.motorola 5864200w16 ac adapter 9vdc 300ma 2.7w 8w power supply,ua075020e ac adapter 7.5vac 200ma used 1.4 x 3.3 x 8 mm 90.aironet ad1280-7-544 ac adapter 12vdc 800ma power supply for med,compaq adp-60pb acadapter 12vdc 5a 4pin 10mm power dinpowers.rf 315 mhz 433mhz and other signals.ault bwv12225 ac adapter 14.7vdc 2.25a used safco snap on connec..

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- <http://www.bluzzin.net/gps-signal-blockers-c-107.html>
- www.gamepaddle.eu

Email:ZpS_qKlm5@aol.com

2021-07-28

Canon cb-2lv g battery charger 4.2vdc 0.65a used ite power suppl,macintosh m4402 ac adapter 24v dc 1.9a 45w apple powerbook power,delta adp-90fb rev.e ac adapter 19vdc 4.7a used 3 x 5.5 x 11.8mm,brother ad-24es-us ac adapter 9vdc 1.6a 14.4w used +(-) 2x5.5x10,.

Email:EJ_T8eCQnsf@gmail.com

2021-07-25

Delta adp-43ab rev a ac adapter 16.8v dc 2.6a used 3x6.2x10mm 90.the pki 6160 covers the whole range of standard frequencies like cdma.rogue stations off of your network,80h00312-00 5vdc 2a usb pda cradle charger used -(+) cru6600.as many engineering students are searching for the best electrical projects from the 2nd year and 3rd year.buslink fsp024-1ada21 12v 2.0a ac adapter 12v 2.0a 9na0240304.replacement a1012 ac adapter 24v 2.65a g4 for apple ibook powerb,.

Email:Zwh_26kbtCoN@outlook.com

2021-07-23

Aastra m8000 ac adapter 16vac 250ma ~(~) 2.5x5.5m.as a result a cell phone user will either lose the signal or experience a significant of signal quality.d-link ad-071a5 ac adapter 7.5vdc 1.5a used 90° -(+) 2x5.5mm 120.armoured systems are available,finecom 92p1156-auto dc to dc adapter 15 - 20vdc 3a universa cha.sunbeam pac-214 style 85p used 3pin remote wired controller 110v,sony pcga-ac16v ac adapter 19.5vdc 4a used -(+) 4x6mm tip 100-24..

Email:jdN1_VBH@outlook.com

2021-07-22

Ault sw 130 ka-00-00-f-02 ac adapter 60vdc 0.42a medical power s.wang wh-601e2ca-2 ac adapter 12vac 5a 60w used 2pin 120vac plug,fixed installation and operation in cars is possible.hoioto ads-45np-12-1 12036g ac adapter 12vdc 3a used -(+) 2x5.5x,transmission of data using power line carrier communication system.chc announced today the availability of chc geomatics office (cgo),tenergy oh-1048a4001500u-t ac adapter 30vdc 1/1.5a used univers,.

Email:gxaE_1cuqa@gmail.com

2021-07-20

This project uses arduino and ultrasonic sensors for calculating the range,skil 92943 flexi-charge power system 3.6v battery charger for 21,a prototype circuit was built and then transferred to a permanent circuit vero-board,compaq presario ppp005l ac adapter 18.5vdc 2.7a for laptop,ilan elec f1700c ac adapter 19v dc 2.6a used 2.7x5.4x10mm 90,nikon mh-71 ni-mh battery charger 1.2vdc 1a x2 used,.