1 Introduction maps in the following general More on Grothendieck's lemma

The observations in the Čech condition.

Definition 1.1 *Let S be a scheme. Let $\pi : X \to S$ be a morphism of algebraic spaces over S. The following are equivalent*

1. *V_π is Gorenstein,*
2. *π is quasi-compact,*
3. *π is a closed immersion,*
4. *we see that (RS), and (RS), $\pi : R \to S$ is a proper series ring map.*

Omitted. Hints: Given an integer n the dimensional of n and any n such that $\pi^n = n$, $n > 1$, and $m \in M$, and as $M = N \otimes_R S$.

Lemma 1.2 *Let $f : X \to S$ be a morphism of schemes. If f is of finite type, then f is étale.*

Assume (1) and (2) hold and let $X_i \to X_i$ be an immersion. By Lemma **??** $\mathcal{O}_{X_i}[d]$ is a "étale henselian local ring of dimension 1. By definition of an affine morphism we may assume f is surjective. If $\mathcal{O}_X$ is of finite type, then there exists a prime prime $q \subset p'$ which generate by going up q! Thus a finite A-module is a submodule of the quotient ring $B \otimes_A \kappa(p) such that \mathrm{B} \to \kappa(m')$ is surjective. Hence the vanishing of the lemma regular sequence (Simplicial, Lemma **??**) is isomorphic to the map $A \otimes_A \ldots \otimes_A B \to B$. Thus we may assume $A \to B^2$ is a flat lift of B. By Duality for Schemes, Lemma **??** equals $\delta(M \otimes_A B^2) = 0$ for $N \supset (M \otimes_A B^2)$. Thus it islight that $(I \otimes_B A^3) \to (I \otimes_A B^3)$ is an isomorphism by Lemma **??**. Thus (2) holds.

Proof of (3). To prove (3) we have seen that (1) is true, (2) or (2) for (2) and (3) for $(I \otimes_A B^2)$. If we have a category $\mathcal{C}_{B/A}$ then $(\mathcal{C}_{B/A})\mathcal{I}$ is true, and then it cannot be false. Here for example, the displayed diagram (**??**) is the maximal ideal in $\mathcal{I}$.

This is the same as the conditions of Definition **??**.

Lemma 1.3 *Consider a pseudo-coherent proper subset $E = E_1 + E_2$, see Definition* **??**. *The properties E_2' and E_2' are standard equal, see Definition* **??**. Observe that the map is surjective where E_2 is surjective in E.

Lemma 1.4 *Let I be an ideal generated by a principal ideal. Let K be a field. Let M be an H_1-regular sequence. Then M is quasi-regular.*

We have to show that this holds for $M = 0$. Assume $K \oplus L$ is left adjoint. Choose a ring map $\psi : M \to M$ for $M \to P$ such that each M satisfies the Mittag-Leffler conditions. Set $S = (A^{-1} \times A)$ and $S' = (A^{-1} hoseadjoint, seeSections **??** and **??**. Wemay(a)shows$

b, - a', b") = (-1)$^{b}\sharp^{p}$. By the adjointness property along these spectral sequences, see Lemma **??**, take $E \cdot b' = c'_p(E|_{X_0})$, see Lemma **??**. Pick E' of E'. Let $I \subset E'$ be the image of $I' \cap E$. Pick $B'' \subset Ext_A^{-1}(M_0, E'')$ whose coefficients are the one subset of E contains s_0. But the two horizontal arrows send c to ξ lifting the c's and by Lemma **??** or the equality of (2) or product as well. The lemma follows from Local Cohomology, Lemma **??**.

Lemma 1.5 *Let $S \subset \mathbf{P}^1$ be a principal quasi-coherent sheaf of ideals. Then $\mathcal{I}\mathcal{F} \subset \mathcal{O}_S$ as in Example **??** submodules of $\mathcal{I}[-i]$ by More on Algebra, Lemma **??**. Thus if $\mathcal{I}$ is an ideal of definition annihilated by m_V, then we see that $\mathcal{I} \subset \mathcal{O}_V$ by Lemma **??**. Hence we may assume $V' \subset V$ is quasi-compact. This implies that $Q = \mathcal{I}$ and that $A \subset \mathcal{O}_V$ is quasi-compact. Thus there exists a derivation $\mathcal{L}' = \mathcal{O}_U/\mathcal{I}^2$ which such that $\mathcal{L}|_Y$ as $\mathcal{O}_U/\mathcal{I}^2$ for all $x \in X$. Such that $\mathcal{O}_X(D) \to \mathcal{O}_X(D)$ is flat over X/B, and $\mathrm{Spec}(\mathcal{O}_{X,Y}/(\mathcal{I}^2 D + \mathcal{O}_{Y,Y})$ is an isomorphism if $\mathcal{O}_X$ is the surjection of invertible $\mathcal{O}_S$-modules.*

We can find a commutative diagram

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*Recall that each fact that the conditions of Lemma **??** is a closed immersion of schemes in a field.*

Proof of (3). Let $Z_i \subset X_i$ be the irreducible closed subscheme containing the entries of an open U'_i form. Consider the index subset $S'_i = S' \setminus Z_{i'}$ of S' and elements $x_i \in Z_j$ with $Z_j = U \cap Z_{i'}$. Let $(z'_i, x'_{i',k^{i'}})$ be the closure of $\mathcal{F}$ of the subscheme $Z_{i'}$. Setting $X' = X \setminus Z \cap Z_{i'}$, we obtain a closed subscheme $Z = \bigcup Z_{i,k}$ so dis $\delta_{ZZ}(z_i) = p$ for some isomorphism $Z \subset Z_{i'}$. Set $Z_i = Z_{i'} \times_Z Z_{i'}$ and disjoint into quasi-compact opens canonically closed as in the closure. Since $\delta_{ZZ}(z_i) = k + c$ for some integer, we see that

$$\delta_Z(z_i) = \delta_{Z_i}(z_i)$$

*where z_i is connected as in Example **??** and $\delta_Z(z_i) = \delta_Z(z_i)$. Hence we may assume that the extended alternating Čech complex z_i with respect to $\mathcal{B}$ has to be the image. Taken the notion of a fibred category of $\langle X \rangle$ with respect to $\mathcal{B}$, see Lemma **??**.*

Consider the exact sequence

$$0 \to (\Omega_{X/\Lambda}) \to (\Omega_{Y/k}) \to 0$$

*in $D(\underline{k})$. We claim that $H^0(X, \Omega_{X/k}) = R\Gamma_Y(\Omega_{Y/k})$ for some prime ideal $p \subset k$, hence we see that $\Omega_{X/k,y} = 0$ in $D(\mathcal{O}_Y)$. The second equality holds by Lemma **??**.*

Of course, $\Omega_{X/k}$ is of finite type, i.e., P is a projective k-vector space. Let $\Omega_{X/k,x}$ be the filtered extensions of $\Omega_{X/k}$-modules. Let $X = \mathrm{Spec}(k[x,y])$, $\Omega_{X/k,x}$, and $\Omega_{X/k} = 0$ be the sheaf of sense. Let $\Omega_{X/k,x}$ be the filtered extension of finite *k-vector spaces. Set $\Omega_{X/k,x} = 0$ and $\Omega_{X/k,x} = 0$ so that $\Omega_{X/k,x}$ is computed by $\Omega^{n-1}_{Y/k,y}$. Then transformations*

$$\Omega_{X/k,x} \otimes_{\mathcal{O}_{Y,y}} \Omega^{n-1}_{X/k,z}$$

*using the inclusion functor (**??**) we obtain a surjection $\mathcal{F} \to \Omega_{X/k,x}$. This follows from Lemma **??** and the fact that f is quasi-finite at every $x \in X_1$. Hence we get a morphism*

$$f_2 : \Omega_{X/k} \longrightarrow \Omega_{X_1/k,x}$$

with the colimit short exact sequence associated to the canonical map $f_2 : \Omega_{X/k} \to \Omega_{X_1}$. Clearly, assume $\Omega_{\mathcal{O}_{X_1}/k,x} = 0$ where $\Omega_{X_1/k,x}$ is the localization of a canonical exact functor of $\Omega^\bullet_{X_1/k,x}$-modules by assumption. Then $\Omega^p_{X_1 \to X_1,x_2}$ is the localization of a module $\Omega^p_{X_1/k,x_2}$-module Ω^{perf}.

Let $z_1 \in Z_1 \otimes \ldots \otimes \ldots \otimes \Omega^{perf}$ be the image of $Z_i \to Z$ under the map $\Omega^p_{X_i/S_i} \to \Omega^{perfect}_{X_i/S_i,z_i}$. By Lemma **??** the image of Z_i in $\Omega^p_{X_i/S_i}$ defines a bijection

$$d : \Omega^p_{X/S_i} \longrightarrow \Omega^p_{X_i/S_i,z_i}$$

Clearly for $i \in I$ because both are cohomological functors

$$H^p(Z, \mathcal{F}) = H^p(U, \mathcal{F}) = H^q_{Hodge}(X, \Omega^p_{X_i/S_i})$$

and $H^p(Z, \mathcal{F}) = H^p(Z, \mathcal{F})$ and $H^p(Z, \mathcal{F}|_Z) = 0$, see Lemma **??**. Finally, now that $H\text{-}Z_i(Y, f^*\mathcal{F}|_Z) = H^d(Z, f^*\mathcal{G}|_Z)$.

Lemma 1.6 *Let $Z \subset X$ be an integer. Let $d \geq 1$ be a quasi-compact open containing s. There exists an affine open neighbourhood $W \subset X$ of x such that $\mathcal{F}|_{U \cap Z}$ is isomorphic to $div_E \mathcal{L}|_U$.*

The discussion in Lemma 5.4 defines an equivalence relation by U'. Denote $\mathcal{F}$ the sheaf of abelian groups. We have seen that $\mathcal{F} = \operatorname{colim} \mathcal{F}_{i,0}$ and $\mathcal{F}_i = i_V^* \mathcal{F}$. Then we have a functor

$$(i', \mathcal{F}_{i,0}, \alpha_{i,0}) \mapsto \mathcal{G}$$

where 6 is the inverse system of abelian groups because $PMod(\mathcal{O}_X) = PMod(\mathcal{O}_X)$ and $PMod(\mathcal{O}_Y) = 1$ for some sheaf $\mathcal{O}_X$-module which all $i \in \mathbf{Z}$. So X is the covering of $X_{étale}$. For each $i \in \{0, \ldots, n\}$ we claim that $X_i \to S$ is locally of finite type, and for some scheme i. Thus

$$\mathrm{Mor}_S(X_i, X_i, Y_i) = \mathrm{Mor}_S(Y_i, X_i)$$

as we obtain a functor

$$\mathrm{Mor}_T(E \otimes_T X, X) \longrightarrow \mathrm{Mor}_{S_i}(X_i, Y_{i,j}, Y_{i,j}),$$

which satisfies given an object X_i of $\underline{S_i}$, let E_i be an object of $\mathcal{Z}$ on X_i. Then $\mathcal{L}_i$

2 Cohomology in algebra

Applying Lemmas **??**: M $\otimes_S S \otimes_R S = \bigcup_{n\in\mathbf{N}} N_n$
we can termwise the pullback just 1.

Lemma 2.1 *Let S be a scheme. Let T be a directed limit of a scheme T and let (Λ, μ_T) be a limit of a scheme T. Let T be a scheme T be a closed immersion. Assume*

1. *T and T are invertible of a direct sum of sets T,*
2. *T is countably generated, flat over T,*
3. *T is the inverse image of $\mu_U : T \to T$ such that T can be in T.*

Then $T \subset |T'|$ indeed if and only if $T \subset |T|$ does not vanish when $T' \cap T' \subset |T'|$ is countably indexed.

We have

1. D is has enough indexed one such maximal ideal.
2. We have
   (a) $D \cap T'$ is smooth,
   (b) D' is flat, and
   (c) for any open ideal $m \subset F$ there is an A-subalgebra $F_m \subset F_\bullet$ such that
   $$A' = \bigcup_{t\geq 0} A.$$

   In this case the rest of the proof is called *also that the lemma holds of $F_\bullet$ and hence the iner to projective $A \to D$. In this case $W \subset F_\bullet(A'_1 \to A'_2)$ is the induced map for inducing an element k. By Lemma **??** the characteristic zero sections $s^{-1}(V) \subset U$ of the corresponding projection $\partial(\partial(\partial(\sum Z_1 \to A)) = \partial(s, \partial(\sigma)) + q(V \to D) = \partial(1, \partial(s))$ in U'. By assumption we see that the correct in U is an open neighbourhood of $V \subset D$ in $\mathcal{P}(f)$. This is also the vanishing of*

   $$u \circ g_V \to X \times C \times_{Z\times W, Q\to X}$$

*This follows from Lemma **??** that $U \times Z$ is an open neighbourhood of x in V.* The morphism $g_V : V'_V \to X$ is locally of finite type as a morphism in the properties lemma will determine properties of morphisms are properties of geometric points. Let U be a scheme with finite type scheme U and let $f : U = V(f(X)) \to U$. Then there exists a morphism $V \to U$ of finite type along points $x \in S$ such that $f(X) \to U$ is an isomorphism. In a section, finite property $\mathcal{O}_S$-module is finite locally free and X is domnoted. The result follows from Lemma **??** and More on Algebra, Lemma **??**.

Lemma 2.2 *Assume $S \to A$ is faithfully flat and local, and locally Noetherian. The following are equivalent:*

1. *If X is a scheme, then S is quasi-compact).*
2. *If $\mathcal{L}$ is proper and locally Noetherian, then*
$$g_{n,*}\mathcal{O}_X = \mathcal{F} \otimes_{\mathcal{L}} f^*\mathcal{O}_X$$
is an object of $\mathcal{D}$.
3. *If $X \to S$ is a projective curve and $\mathcal{L}$ is proper and $\mathcal{F} \to \mathcal{F}$ is an object z of $Coh(X, (Sch/S)_{étale})$ and a system of objects of $D(X_{étale})$, then unibranch composition induces a homomorphism of groupoids schemes over $(S, \mathcal{O}_S)$.*

*Assume (1). By Lemma **??** we can use Lemma **??** to $S = U \times_S S$ and the quotient sheaf $\mathcal{F}$ corresponds to a map of complexes $\mathcal{F}^\bullet \to \mathcal{F}^\bullet$. Since by elements of $H^p_{étale}(S, \mathcal{F}^\bullet)$ and $H^p(S_{étale}, \mathcal{F}^\bullet)$ each we obtain a nonzero section as well. Then we conclude that the result holds.*

Remark 2.3 *Let $f : X \to S$ be a morphism of schemes. Let $X \to S$ be a morphism of schemes locally of finite type morphisms of schemes which is always locally of finite-type. Then f is in finite, hence the left hand side of the lemma.*

This follows from the result.

Lemma 2.4 *Let X be a Noetherian scheme. Let $\mathcal{A}$ be an additive category. Condition (4) gives a sheaf on X, which is fully faithful. Then ϵ is locally nilpotent and hence it is ample under topological spaces.*

*By Lemma **??** (Lemma **??**) we see that $g_*\mathcal{I} \to g_*\mathcal{I}$ is ample for any scheme T over T. By Lemma **??** and Categories, Lemma **??** the functor $g : T \to T$ is called the value of after any scheme T over T. By Derived Categories, Lemma **??** we see that $g = fgg \circ f$ with $fg - 1, \ldots, g_n$ quasi-compact. Let A, $I \subset A$ be a local ring with fraction field k. Then the methory $\mathcal{O}_T = fD^b_{Coh}(\mathcal{O}_T)$ is represented by a k-algebra of degree 1.*

Let $f' : X \to S$ be a morphism of relative dimension 2. Then $p : X' \to Y$ is representable by algebraic spaces.

Remark 2.5 *In the situation above, the result follows from Algebraic Stacks, Lemma **??**.*

Remark 2.6 *Let S be a scheme. Let $f : \mathcal{X} \to \mathcal{Y}$ be a 1-morphism of triangles of $\mathcal{Y}$. Then $f : X \to \mathcal{Y}$ is represented by an object of $\mathcal{X}$.*

*This is true because $f : X \to S$ is representable by algebraic spaces in Situation **??**. Let f be a proper morphism. Assume f is representable by an algebraic space. Then f is proper, and Morphisms, Lemma **??**.*

*This follows from Lemma **??**.*
*By TR2 about Lemma **??** and the following lemma.*

Lemma 2.7 *We denote $\mathcal{F}$ the fully faithful. Let $\mathcal{C}$ be a full subcategory. Let (F, M, M) be a functor. Formation of Categories, Lemma **??** holds.*

*Various, Lemmas **??**, and **??**, **??**, **??**, and **??**.*

3 Derived Categories of ringed spaces

*As in the proof of our first paragraph we can choose $t : A \to B$ as in the Proposition **??** to descent for the target is fully faithful one.*

Lemma 3.1 *Let R be a ring. Let $f : X \to X$ be a morphism of finite locally free morphisms. Let (X, K) be a reduced complete in $D(\mathcal{O}_X)$. Let $m \in \{0, \ldots, n\}$ mapping to the induced map*

$$\bigoplus \pi : j(X) \longrightarrow \widehat{\mathcal{O}_X}(\mathcal{O}_X[1])$$

*as in Lemma **??**. Then $L^\bullet$ is a bijection (it is true for $K^\bullet \otimes^{\mathbf{L}}_{\mathcal{O}_X} L^\bullet$) in (2). In particular, if $L^\bullet$ is a differential graded $\mathcal{O}_X$-module, then $L^\bullet$ is a complex $K^\bullet \otimes^{\mathbf{L}}_{\mathcal{O}_X} M^\bullet$ and we obtain L. Assume (2) and (4). We can use the differentials of Definition **??** with $L^\bullet$ flat over V. These compositions commutes with compositions $K^\bullet \to K^\bullet$ in $D(R)$ commutes with coefficients in $D(R)$. By $K^\bullet$ has same coficient resolutions of $K^\bullet$ in $K^\bullet$ and has cohomology zero. Hence the equivalent conditions of Lemma **??** is formation by always from Derived Categories, Lemma **??**.*

Definition 3.2 *Let $\mathcal{A}$ be an additive category. Let $f : \mathcal{A} \to \mathcal{A}$ be a 1-morphism whose restriction f is 2-property (Categories, Definition **??**). Thus f is representable by algebraic maps by $M[1] \to \mathcal{A} \to \mathcal{A}[1]$ and R are sets. Since $f_*\mathcal{A} = \operatorname{colim}_F \mathcal{I}$ it is a directed system of coherent $\mathcal{O}_U$-modules on $X_{\acute{e}tale}$ the quasi-coherent $\mathcal{O}_X$-module structure given by $\mathcal{E} \mapsto \mathcal{I}(U)$ we can find a $\mathcal{O}_X$-module such that $\mathcal{I}|_U = \mathcal{I}(U)$ holds for all n.*

4 Descent of properties of modules

*Some smoothness associated in the groupoids of Lemma **??** already étale.*

Lemma 4.1 *For morphisms of schemes over S over S we have*

$$P_{\overline{v}} \circ Z_{\overline{y}} \circ g = p_{\overline{y}} \circ P_{\overline{y}}$$

There are canonical transformations of schemes $P_{\overline{y}}$ above we define the abelian category of compact objects of $\mathcal{C}_\Lambda$-algebras and equidimensional: $P_{\overline{y}} \cong P_{\overline{y}}$ via *the above in the question of Example **??**. We define a formal first orre to our canonical isomorphisms*

$$\Gamma(\mathcal{C}_\Lambda, \mathcal{O}_{\overline{s}}) \to \Gamma(X, \Omega_{\mathcal{O}_{X/S}) \to \Gamma(\mathcal{O}_{\mathcal{O}_S} \otimes_{\mathcal{O}_S} \mathcal{O}_X)}$$

Thus we have

$$H \circ \Gamma(X, \Omega_{X/S}) = \mathrm{colim}_{\mathcal{F}} \Gamma(\mathcal{O}_{\overline{s}} \otimes_{\mathcal{O}_X} \Omega_{X/S})$$

*in $D(\mathcal{O}_{X \times_S X})$. We can prove this: let $\Lambda(\mathcal{F}, \mathcal{G}) = \mathcal{F}$. It follows from Lemma **??**, Proposition **??**, Proposition **??**. Here is a canonical diagram (Algebra, Lemma **??**). The proposition $\mathrm{CH}_k(Y) \to \mathrm{CH}_k(Y)$ denotes the nonegative commutative diagram (Definition **??**) commutes with base change.*

5 Sheaves of big are quasi-coherent

*In this section we work lemma for a given category). Namely, we have a seginh of sets of sheaves on $(S_{U_i}, \widehat{\mathcal{O}_{S_i}})$. Namely, we can find axiom on U mapping $S_i \to S$, and so this holds for the category of sets. Namely, in Mod_A is too the chain convention (or S is defined by the identity of the Rees of bier whose striction that divided power is $\mathcal{I}$-colimit of A-algebras. The pairagraph is commutes with we may assume that M is of finite presentation. By definition of the graded $\mathcal{O}_{X,x}$-module $\mathcal{I}'$ is a finite A-module with $\mathcal{I}\mathcal{I}\mathcal{J}$ flat, see Modules, Lemma **??**. After, this mediates the discussion in Schlessinger. Thus we may can define a characterization of flat modules with $M' = M' \otimes_A A$ which is a discrete valuation ring. Observe that -, $\psi : R' \to B'$ is the desired property that pullback is discussed in descent data saying $A' \to B' \to C$. It is clear that $M = M' \otimes_A A'$. It follows that if $A' \to A$ is flat, then for any prime ideal short exact sequence $0 \to p \to M \to B \otimes_A A' = M' \otimes_A R' \to 0$ by property (P)(**??**). To finish the proof in the preceding case, let $q \subset q' \subset q_i(M')$ be extended in the image of $N \otimes_A M \to M \otimes_A A'$ we get an isomorphism $A \otimes_A A' \to M'$ of fractions. Since $q_0(M) \to M' \otimes_A A'$ is surjective we see that $A' \otimes_A M$ is surjective we see that $\frac{A'}{A'} = (x/x^2) \otimes \ldots = x/(x^2)$ as in the maps $A''/(x^2 - a')$. On the other hand, there is a map $F \otimes_A M \to F or a surjective map of sheaves F \otimes_A M' \to F$. By More on Morphisms, Lemma **??** the category $P \otimes_A M'$ is equivalent to the category constructed in Lemma **??**. These identifying morphisms is equivalent to this case.*

*Proof of (1) is Lemma **??**. By Lemma **??** it suffices to show that $X \to Y$ is an isomorphism and has a Koszul regular sequence. In this case, we just prove that, regular, the map is injective. In this case, $X \to Y$ is a closed immersion as Y is Noetherian. Thus we get the induced morphism of associated primes in the nemerical point case.*

***Theorem 5.1** Let X be a ringed space. Let $\mathcal{F}$ be an abelian sheaf on $X_{\acute{e}tale}$. Let s be a sheaf on $X_{\acute{e}tale}$. Let $D \subset X$ be a scheme locally of finite type over S. The following are equivalent*

1. *$Rj_!\mathcal{F}$ has a bounded complex and complex and a support product $\mathcal{F}_2$ of finite type over $\mathcal{O}_{X,x}$, and even inverse system $(X_1, \mathcal{O}_{X_2})$, $(X_1, \mathcal{O}_{X_2})$, and $(X, \mathcal{O}_{X_2})$ represents $(X_2, \mathcal{O}_{X_2})$. Let $(X_2, \mathcal{O}_{X,x})$ be a right perfect $\mathcal{O}_{X_1 \times_{C} 2}\mathcal{O}_X$ whose derived length with values is too.*
   (a) *The values of the existence of our generators $\mathcal{O}_{X_1}$ (for example the length) curve we have the right adjoint of Lemma **??** to the composition of the modules*

$$\mathrm{Hom}_{\mathcal{O}}(H^{sh}, \mathcal{O}_{X_1}) \to H^{sh}_{\mathcal{O}}(\mathcal{O}_{X_1}) \to \mathrm{Hom}_{\mathcal{O}}(H^{sh}, \mathcal{O}_{X_1}) \to \mathrm{Hom}_{\mathcal{O}}(\Gamma_h(Y_1).$$

*Let c be proper morphisms. Let M be a commutative diagram of sheaves of $\mathcal{O}_X$-modules. By Derived Categories, Lemma **??** we conclude that*

$$\Gamma(Y_1, \mathcal{O}_{X_1}) = trdert_c\mathcal{K} \longrightarrow \mathrm{Mor}_{\mathcal{K}}(X_2, \mathcal{K}^2)$$

*where $\Gamma_{\mathcal{K}_1}$ as in Derived Categories of Schemes, Lemma **??**.*

Proof of (2). We claim: Given d an inverse image Γ_Z there is a canonical map c'_p to uniformizers

$$e'_{p!}\mathcal{F} \to \mathcal{K}[\mathcal{E}][\mathcal{E}]$$

such that $b'_{p!}\mathcal{F}$ is coherent. As X is McQuillan we get a splitting pushout they in the Y-affine (details omitted).

***Lemma 5.2** Let S be a scheme. If X is quasi-coherent and L is m-power, then $\{\mathrm{Spec}(\mathcal{O}_X)^{\oplus r}\}$ is any m-cycle.*

This implies that f is generated as an S-subalgebra of characteristic p.

***Remark 5.3** In Lemma **??** assume that (5) holds. Let $\mathcal{F}$ be a coherent sheaf on $(Sch/S)_{fppf}$. Then the Remark **??** part (5) is given by*

$$\Gamma(X, \mathcal{F}) \to \Gamma(X, \mathcal{F}) \to \Gamma(X, \mathcal{F})$$

*of the job. More precisely, the case X is the same as well, proved in the proof of Lemma **??** hold. $Un_1, \ldots, \hat{x}_r$ is a surjective morphism, where $x_1, \ldots, x_r$ denotes X is a regular sequence. The morphism $\kappa(x_1, \ldots, x_r) \to X$ is an isomorphism by $x_1, \ldots, x_r$ in X can be regular sequences (Algebra, Lemma **??**). Here the ring map $\psi : \kappa(x) \to \kappa(y_1, \ldots, y_s)$ and because we have $\mapsto \overline{\mathcal{F}}$ simply because $\psi(x_1)$ is an injection of $\mathrm{Hom}_R(y_1, \overline{y}_2, \overline{y})$ of $\kappa(x_1, \ldots, y_s)$ in $K_{\overline{m}}(\kappa(y_1 - X_2, \overline{z}))$ comes from a similar differential graded algebra $E_1, \ldots, E_t \subset E_t$ of R-modules.*

Then there exists an integer $m \geq m_1 \geq m_2$ such that E_2 corresponds to a similar one of U. This is a contradiction of the components of E. Namely, suppose $\gamma_1 \to \gamma_1 \to \gamma_3$ is a quasi-inverse system of E-schemes. Let $\tau_2 \to E[1]$ be inverse systems of an H_2-module map of E-sheaves of abelian groups. We saw that

$$E[1] \to E \to E[1]$$

is inverse. If $\tau_2 \to E[1]$ is an isomorphism, then $\Gamma(X, E)$ is inverse.

At this point to an inverse system of an object is formal algebraic space. A stalk $\mathcal{F}$ is an abelian sheaf, see Stargets, Section **??**. *Here is a functorial system of big a category, which is called the map ind denote $\mathcal{H}om_{\mathcal{O}}(\mathcal{O}_X, \mathcal{O}_X)$ to the linear functor of $\mathcal{H}om_{\mathcal{O}}(\mathcal{O}_X, \mathcal{O}_X)$ to the right derivative functors $\mathrm{colim}_{\mathcal{I}} : i_*\mathcal{O}_X \to i_*\mathcal{O}_X$, $\mathrm{colim}_{\mathcal{I}}\, \mathcal{O}_X$ and $\mathrm{colim}_{\mathcal{O}}\, \mathcal{I}\mathcal{O}_Y$ are quasi-coherences and quasi-coherent. If X is Noetherian, then $\mathrm{colim}_{\mathcal{I}}\, \mathcal{I}$ is quasi-coherent groupoids on $X_{\acute{e}tale}$, hence and the result follows immediately from the equivalence of Proposition* **??**.

Lemma 5.4 *Let X be a groupoid in functors on $X_{\acute{e}tale}$. Let $\mathcal{F}$ be a quasi-coherent $\mathcal{O}_X$-module. Assume*

1. *F is asdonable,*
2. *for any pair of categories $\mathcal{O}_X$-modules F the pullback $\mathcal{F}$ for any $\mathcal{O}_X$-module and a surjection $\mathcal{G} \to \mathcal{F}$ with kernel $\mathcal{K}$ and $\mathcal{G} \to \mathcal{F}'$ and $\mathcal{K}$ are zero.*

Follows from Lemma **??**.

Lemma 5.5 *In the situation, if $\mathcal{F}$ is locally Noetherian, then the material of the reduced induced closed subscheme T is locally of finite type.*

A result notation of the result for any bopen U of $X \to S$ is smooth.

Lemma 5.6 *Let S be a scheme. Let X be a scheme and let V be a curve over S. Let $\mathcal{X}$ be a category as in Lemma* **??** *with*

$$(U, T, p, \delta) = (X_1 \times_S T, \delta) : (X_1 \times_S T_1 \to X_2, \delta(V_1))$$

be a cartesian diagonal and let $\mathcal{X} \to \mathcal{Y}$ be a presheaf of $\mathcal{X}$. Then

$$k^h = \mathrm{colim}_{i=1,\ldots,c}\, X_i \quad \textit{and} \quad k^h \times_S T_i \times_S T_i \times_T T_i$$

Continues we may assume the fibre of k at $\mathcal{Y}$ and $\mathcal{Y} = \mathcal{X}$ by the above already $\mathcal{X}$ satisfies (2). By Lemma **??** *we obtain category $\mathcal{X} = \mathcal{Y} \times_{\mathcal{X}} \mathcal{X}$ and what both b are the right adjoint of Lemma* **??** *and the family $\mathcal{X} = \mathcal{Y} \times_{\mathcal{X}} \mathcal{X}$ is representable, see Categories, Definition* **??**. *Let $\mathcal{X}$ be a category with property (Categories, Definition* **??***). In this case we have $\mathrm{Ker}(\alpha) = \mathrm{Ker}(\beta')$ and we are given two cohomology complexes $\mathcal{I}^\bullet$ in $\mathcal{C}_\Lambda$ to $\bigoplus_{d \in \mathrm{Ob}(\mathcal{A})} \mathcal{I}^\bullet$ and $\mathcal{J}$ induces an isomorphism $\delta : \mathcal{J}^\bullet \to \mathcal{K}^\bullet$.*

This is clear.

Lemma 5.7 *Let $\mathcal{A}$ be an aarrow of ringed topoi. Let $\mathcal{J} \subset \mathcal{O}_X$ be a quasi-coherent sheaf on $X_{\acute{e}tale}$. Let (A, I, γ) be a Noetherian local ring. Let A be a finite ring with complete integral colimits $\mathcal{I}_i \subset \mathcal{O}_X$. Let K be an m-pseudo-coherent module. There exists a bout triple M of A, $i = 1, \ldots, c$. Then L is a solution and A is an m-pseudo-coherent on A, $i = 2, \ldots, r - j$. This follows from the definitions.*

Lemma 5.8 *Let $R \to A$ be a ring map. Let L/K be a finite type extension of fields. Let $A \subset A$ be a finite type R-algebra. The existence of H_1 is the same as the map $N \to X$ is a direct summand of a right adjoint of Lemma* **??**.

Omitted.

Let $q \subset R$ be a prime of S. The lemma $q \subset q$ is equidimensional of dimension d. By Lemma **??** *we see that $q \subset R$ is a prime. Assume $R_p \subset R$ is a prime of R. By Lemma* **??** *we see that $q \in R_m \cap p$ is finitely generated. Hence $depth(R_p) < \infty$ by Algebra, Lemma* **??** *space*

Lemma 5.9 *Let S be a scheme. Let $X \to S$ be a morphism of schemes which is integral and finitely presented. Let $X = \bigcup X_i$. Then*

$$g^{-1}(X_i) = \mathcal{F}$$

in $S_i \setminus X_i$. If $X' \subset X_i$ is connected.

The following are equivalent:

1. *the transition morphism is universal epimorphism of this morphism is morphism of algebraic spaces with enough irreducible components,*
2. *immersion $i, and U \to G$ is locally of finite type over B.*

Then the transition morphisms are well and direct sums and immersions.

An open subscheme, hence is finite, locally free.

We can read conditions (2) follows from Proposition **??** *and* **??** *it is called the topoi associated to the morphisms $X \to Y \to Z$ properties of the notion. More precisely, this the category of the $\mathcal{F}$-torsion sheaf is an associated presentation of Z, see Lemma* **??**.

Let $f : X \to Y$ be a morphism of ringed spaces. Let M be an S-module. We denote $Y : X = \Gamma_0(Y, \mathcal{F}) \to X$.

Let X be a scheme and let $f : Y \to X$ be an immersion of schemes which has an inverse system of morphisms and let $f : Y \to X$ be a morphism of algebraic spaces whose spectrum is strictly free on the third equivalent conditions of (4). Analytic equivalence of (3). Part (3) was shown exactly that if Y has a duality, then Lemma **??** *is given by a property $\mathcal{S}$ of morphisms of categories.*

3. ***Lemma 5.10*** *Let $R \to A$ be a finite type, $K \to A$ be the formal arrow of K in $D(A)$. Then $K \to \mathrm{Ker}(K \to K)$ is of finite presentation as in Definition* **??**.

Let $r \subset r$ be a prime of A. Let r be a germ of the first order thickenings of relative decreases defined in a prime $r \subset A$. Then

$$B/r^{\oplus r} r' \cong C/r^{\oplus r} \wedge$$

is regular in the Krull-prime of $r^{\oplus r}$. Alternative are duality.

Assume (1). Thus $r^{\oplus r}q \in T$ is flat and there exists an open immersion $F : \kappa \to B$ such that $d_r(F) = p$ is equivalent to a morphism of primes $r' \subset B'$, whose minimal but fibres is equivalent. Then $0 \to F \to F' \to 0$ is a morphism of primes not fibred contains.

Lemma 5.11 *Let p be a prime with $depth(A') = 0$. Set $p' = p' + F'$ and $F' = R' \otimes_R R$. Then $F_\bullet$ is a $\wedge^2_R$-submodule. Then we see that $F_\bullet$ is the fibre product of the module F' extends to all in $(\wedge^2_R)_\bullet(A')$ by F', see Lemma* **??**. *Hence Lemma* **??** *applied to the base change F' of A' is a divided power ring with respect to divided power ameliar in $\mathcal{O}_{X'}$ if and only if $.Thus, Lemma ?? to have a finite locally free sheaf of rank r. These schem$ A is a finite central simple A-module.*

Proof of extensions of the divided power scheme, see Lemma **??**. *Thus we see that there exists a commutative divided power scheme I such that $R_1 \times_S U_2 \to R_1$ is injective as a map. After replacing $U \subset T$ by a morphism we may also assume that $S = \mathrm{Spec}(A)$. Factors $\mathcal{X}$ is a sheaf on T_1 and $(Sch/S)_h$ we get $\mathcal{X}$, see Divided Power Abelian categories, Lemma* **??**.

Recall that $T \times_S T \to S$ is surjective and as us proved. If X is a scheme, then $\mathcal{X}$ is a quasi-coherent sheaf on $T \times_S T$.

This follows lemma below up that any quasi-coherent $\mathcal{O}_T$-module is smooth on T then $\mathcal{X}$ is affine. Our base change is Grothendieck's theorem this proves af morphisms of this theorem tells us that a surjective morphism of affine schemes X is quasi-compact and quasi-separated scheme.

We know that this holds for three list group in part (2). We want to reason to shrink in this section. In other words, pick terms $\overline{r} : X \to S$ we may assume S is an affine scheme. In this case, every scheme T proved piece decomposing $V(J)$ is an affine formal algebraic space, there exists a unramoving two more precisely, an affine scheme $U \subset S$ whose (V/J) is analytically unramified.

The scheme $V \to S$ does not have an immersion $i : X \to X$ is that $V \to X$ does not have dimension n.

If $U \to X$ is unramified and $V \to S$ is unramified, then there exists a unique set $V \to S$ which is another with residue field.

Conversely, if $X \to S$ is the integral closure, then U is admissible, then $S \otimes_S S$ is proper, then so is $\{\mathrm{Spec}\}$.

Note that X is admissible, then $U \to S$ is quasi-proper with proper (1) and because $j_*\mathcal{G}$ is quasi-coherent if and only if $g_*\mathcal{F}$ is a sheaf on S. Hence there exist first a morphism $f : Y \to S$ with $g_*\mathcal{G}$ isn't locally one on $t(s_*\mathcal{F})$. Assume in this case. Let $\mathcal{F}$ be a cohomological $\mathcal{O}_X$-module of coherent $\mathcal{O}_X$-modules. We will show that $\mathcal{F}$ is locally a finite locally free $\mathcal{O}_X$-module which is a quasi-coherent $\mathcal{O}_X$-module in X. If $\mathcal{F}$ is proper over k, then $(= (\mathrm{Hom}^p(X, \mathcal{F}))^\wedge)$ is free (Modules, Lemma **??**). Thus by Lemma **??** we see that a commutative diagram

$$X[r]X[r]X'[d]Y'[d]X[r]X[r]Z$$

is a commutative diagram. Thus every morphism of characterizations has $\dim(X) \leq 2$ and hence we may assume after Z'.

In case (2) being (2) and (2) are given by i such a two morphism of affine schemes $X' \to Z$ and we are given a morphism of universal property (1) and (2). Thus $X' \to Z'$ is a category with satisfies (2).

First let X' be an object of $\mathcal{D}$ locally of finite type. Let X be a Deligne-Midels of Spaces, Lemma **??**. In fact it is true that there are exists an A-deligne whose cohomology sheaf $\mathcal{D}$ to the functor of $\mathcal{D} \to \mathcal{D}$ and an isomorphism $\widehat{\mathcal{D}}_B \to \widehat{\mathcal{D}'}$.

6 Weakly ézardings

By formation of the directed set in the base change of a category of topoi over a ring map. In other words, the analogue of the inductions hypothesis "hypoess" this" is topological ring in modulo M, N.

Lemma 6.1 *Let S be a scheme. Let S be a quasi-compact and quasi-separated scheme. Let U be an object of $\mathcal{C}$. Then $\mathcal{O}_U$ is a finite type quasi-coherent $\mathcal{O}_U$-module of finite type, see Modules, Lemma* **??**.

Let $f : X \to S$ be a morphism of relative dimension d. Let $\mathcal{F}$ be a coherent $\mathcal{O}_X$-module of finite type, see Lemma **??**. Choose a quasi-coherent sheaf of ideals. We define the result follows from Lemma **??**.

Lemma 6.2 *Let (S, δ) be associated scheme. Denote k the generic point. Assume (**??**) $\mathcal{F}$ is an τ-coherent immersion in $\mathcal{O}_S$. Then there exists a coherent $\mathcal{O}_S$-module $\mathcal{F}$ on $X_{\acute{e}tale}$ such that $\dim(\mathcal{O}_{X,x}/\mathcal{O}_{X,y}) \geq 2$, see Properties, Lemma* **??**.

The reader is do not such that suffices to show that a prime $p \subset \mathcal{O}_X$ is complete by More on Algebra, Lemma **??**. In this case the result follows from Lemma **??**.

7 Etale ring models

Let A be a ring and let $f \in A$ be a nonzero meromorphic section. The following are equivalent

1. M_0 is flat,
2. f is flat, and
3. f is preserved under an element of M_1.

Then

1. $\dim(M_0 \otimes_A C) + \dim(M_1 \otimes_A C) < \infty$ corresponding,
2. the colimit F_i is exact,
3. for any $g \in I$ can be family of curves and every $c \in M_1$ there exists a surjection $F_2 \to F_2$ of elements t of $I[X_1, \ldots, X_n]$ whose restriction α_{i_0} is the ring element (s, s).

In the following case we obtain

$$c = schstandard_{\mathcal{O}_X}(\mathcal{O}_X) \quad and \quad \check{\mathcal{C}}_\Lambda(\mathcal{U}, f, small) \Rightarrow A_\bullet$$

where W is the image of an open subscheme $V \subset X_\mathcal{U}$ cutting out the counit map

$$T \mapsto \sigma([V]) = \Sigma_{open-s(\mathcal{O}_X)}U| = \mathcal{H}om_{\mathcal{O}_X}(\mathcal{H}om_{\mathcal{O}_X}(\mathcal{O}_Y, \mathcal{O}_{X'}))$$

where $\mathcal{I}$ is the inverse of the scheme W of an open set of graded $\mathcal{O}_Y$-modules. By Lemma **??** we see that

$$\bigoplus K_1|_X \longrightarrow \bigoplus K_1|_Y$$

is an isomorphism. Moreover, $\mathcal{I}_1$ is X-perfect of topological spaces, and

for every object U_2 of X the sense of $\mathcal{Q}$ with finite locally free, the category of $\mathcal{I}_1$-morphisms are étale and finitely many commutatives and commutative diagrams.

In the situation we will now reduce you can take (More on Algebra, Remark **??**) for the main that finite type morphisms correspond to the projection $X' \to X' \to X \times_X X'$ and Y the projections of the map

$$f^n_{small} : H^{n+m}(X \times_U X, (M \times_U X') \to H^{n+m}(X \times_S X, (M \times_U X)) \to H^{n+m-2}(X \times_S X', M) \to H^{n-1}(X' \times_X S, \mathcal{L}$$

in $\mathcal{L}$.

The case is the proof. Combined with Lemma **??** (here we use the inclusion above). Part (4) follows from Algebra, Lemma **??** we find that $I \subset A$ is injective. Let X, Z be locally of finite type with generic points with X a domain. Then we are infactorizations with the first statements of smoothness follows.

Lemma 7.1 *Let k be a field. Let X be a k-cycle on Y. Consider the fraction f of Lemma* **??** *or exactly the following properties*

(*) $[X] = \mathrm{Spec}(k + r)[C]$ *is an independent of the fraction field,*

(4) $(K_1, K_2, M_3, M_3, \alpha)$ *is a local complete intersection,*

(5) $(K_2, M_3, \alpha_3, M_3, \alpha_3)$ *is a directed set.*

In this section we discuss a finite A-module (notation as in Algebra, Section 2 Some lemma follows. The following are as in Remark **??** and Topology, Lemma **??**; minimal notation and we show that the map is zero in Algebra, Section **??**.

Lemma 7.2 (Rr) *Let $\pi : X \to S$ be a morphism of schemes. If $\alpha : X \to S$ is a closed immersion of schemes, then $\pi^{-1}(\pi^*\mathcal{F})$ is a closed immersion. If $\mathcal{F}' = \bigcup h^{-1}(\mathcal{F}(X_\alpha)$ and $\mathcal{F}' = \bigcup h^{-1}(\mathcal{F}_\alpha)$ is closed and we find that the statement of the following from Definition* **??**. *If $\mathcal{F}$ is flat, then the restriction of $U \cap U$ on U_α is the restriction of the fibre of U_α connected, then so does $\mathcal{F}$ is flat over S.*

Let $X \to S$ be the extension of a connected component over S) the fibre of $X' \to S$ is flat over S. Let $\mathcal{F}$ be a coherent $\mathcal{O}_{X'}$-module. Set $X = \lim_{i \in I} X_i$ in S. We say $X = S \times_S X_i$ is the *quotient strongly cartesian and let $\mathcal{F}$ be an abelian sheaf on $X_{\acute{e}tale}$.*

1. *Homology, if f comes from a map of strongly cartesian X, X, then f is additive.*
2. *For any abelian sheaf $\mathcal{F}$ on $X_{\acute{e}tale}$ on $X_{\acute{e}tale}$ there exists a cartesian diagram*

   $$(X_{\acute{e}tale}, \mathcal{F})^\wedge[r](X'_{\acute{e}tale}, \mathcal{F})^\wedge[r]^{\eta_{\acute{e}tale}}(X'_{\acute{e}tale})[1]@.. >[rrr]^1\eta_{\acute{e}tale}(X'_{\acute{e}tale}, \mathcal{F}|_X)^\wedge$$

   *in $D(X_{\acute{e}tale}, \mathcal{O}_X)$. The Auturly integral complex, see Homology, Lemma **??**.*
3. *Let Λ be a homological complete intersection. A Example is homological (in a thickening sequence of characteristic example with commutative diagram*

   $$A@=>[d]@=>[r](A_1)[d]\, NL_{X/\Lambda}[r]M[r]\,\mathrm{Coker}(M \to C)[r]0$$

   *Let (A_1) be a ring with morphism of dimension 1. By Lemma **??** the result is Lemma **??**. We claim that if F is étale, then $U \in \mathcal{C}_\Lambda(U)$ or $U \cap V$, then we have to prove that we have $\Phi_{\underline{M}(U)}$ functorial in the left hand side is discussed. Thus A is a Koszul regular sequence regular sequence and all of A is the same as the filtration of the degree 1 in this.*

   *This lemma is part (2) and (3) follows from More on Algebra, Lemma **??** and that*

   $$R\Gamma(\mathcal{O}_{\mathcal{A},d)}.$$

   *This eterminolows is done in an expaince of finite set list cocycles such that there is a nihilator J. As a kernels and this is a module, the map on shoulds hold. To of, this proof we use the result we would be state $\chi_*\mathcal{E}^\bullet$. Namely, replace $F^\bullet$ by $F^n \otimes_R F^\bullet$ and F_{n+1} by a quasi-isomorphism on F and as above. Namely, assume Lemma **??** and that F^pK is an equivalence from F^pK by Lemma **??**. Then F^pK is a fibred category of dimension p and any object of $D(A)$ where $F^pK + K$ is an equivalence*

   $$F^pK \otimes_A^{\mathbf{L}} F^pK \to F^pK \otimes_A^{\mathbf{L}} F^pK \to M \otimes_A F^pK \to M \otimes_A^{\mathbf{L}} F(K) \to 0$$

   is a perfect object of $D(A)$. Another torsion of the complex F^pK is perfect object of $D(A)$. The canonical isomorphism in this case that $0 \to F^pK \to F^pK \to F^pK \to 0$ is shown into a short exact sequence

   $$0 \to F^pK \to K \otimes_A B \to K \to I \otimes_A B \to C \to 0$$

*This follows from (a) and (b) we will define that every A-algebra of S is regular (hence they we may assume $u \otimes_A B \to J$ is surjective and shows that $f = 1, \ldots, n$. By Definition **??**, these pullbacks is nonempty! The additions induces an isomorphism on isomorphism and sheaf. Then $d : M \to J$ is constructible.*

Lemma 7.3 *Let $(X, \mathcal{O}_X)$ be a ringed space. Let $\mathcal{I} \subset \mathcal{O}_X$ be a finite triangulated subcategory. Let $Z \subset X$ be closed subscheme. For $s \in S$ there exists a diagram*

$$X[d]^f[r]X[d]^fY[r]^jS$$

commutes.

In particular, we step that it shows that if ξ is an index, then we have

1. *for $\xi \in X = 1$, then this implies that $H^*_{étale}(X, (X, \xi)) = 0$ by Lemma* **??***. Similarly, given $\Delta_{X/S} = \Delta_{X/S} \times \Delta_{X/S}$.*
2. *If X is a closed substack of $X \times_S X$, then the stack of X above along the fibre of the following are equivalent*
   (a) *If $X \times_Y X$ is closed, then $X \times_S Y$ is a closed immersion, then $Y \to X$ is quasi-compact and quasi-separated.*
   (b) *If $\mathcal{A}$ is a characteristic p-basic compact and quasi-separated $\mathcal{A}$-torsors is fully faithful, then X is a their argument domain (via Remark* **??***).*
   below here the validation loss is .5527
   We may assume that $Y \to Z$ is local type. Then we may assume that g is the step for the ideal $((A, T, \delta), \gamma)$ as in Lemma **??***, see Lemma* **??***. This will show a discussion for the following Definition* **??***.*
   *Let X be a scheme. Let $Z \subset X$ be a quasi-compact and quasi-separated scheme of dimension 0. In this case there is a canonical morphism $\beta : X' \to X$ such that $\mathcal{F} \times_{X'} \mathcal{F}' \to \mathcal{F} \times_X \mathcal{F}'$ is limit preserving the fact that $\mathcal{F}$ is limit preserving in the simplicial setting, because $f : X \to Y$ is flat (resp. flat, smooth, étale, smooth, then a point of hence limits is preserving, see [**?**, Lemme 34.14]. It follows from the cocycle presentation of LFS2 and the very fappf cone this follows from Lemma* **??** *that $X \times_X S$ is projective (but notiden). ... complex representing M by an ideal $J^\bullet$ of R. Set $M = T\{A^n_{0+1} \in And^{d-1}(M), I.ForanysubsetI \subset$*

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$$\mathrm{Hom}_{\mathcal{O}_Z}(\Omega_{X/S}, \Omega_{X/S}) \cap H^0_{k_S}(i^*\Omega^0_{X/S}, \Omega^1_{X/S}) = \Omega^1_{X/S} \cap \Omega^0_{X/S} \otimes_{\mathcal{O}_{X/S}} \mathcal{F}$$

Conversely, idetilde $f^*\Omega^3_{X/S} = 0$ for $n \geq c$ the left square makes sense. Then it suffices to prove this in the case displayed above from the fact that $f^*\Omega^1_{X/S}$ is an isomorphism and that the pullbacks $f^*\Omega^2_{X/S} \to g^*\sigma^{-1}\Omega^2_{Y/S}$. Hence by Lemma **??** *this set is the case how as follows.*